Initial Study and Draft Mitigated Negative Declaration

Hidden Creek, Inc.

Planned Community Use Permit Amendment

February 2021

Prepared By

Del Norte County
Community Development Department
Planning Division
981 H Street, Suite 110
Crescent City, California 95531

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Exhibits and Appendices Follow

Project Information Summary

1. Project Title: Hidden Creek Planned Community Amendment
Use Permit

2. Lead Agency Name and Address: Del Norte County
Planning Commission
981 H Street, Suite 110
Crescent City, CA 95531

3. Contact Person and Phone Number: Taylor Carsley
(707) 464-7254
tcarsley@co.del-norte.ca.us

4. Project Location and APN: Hidden Creek Subdivision
Crescent City, CA 95531
APN 116-310-001, 002, 009, 010, 014, 015, 020, 021, 022, 023, 024, 025, 046, 030, 031, 032, 026, 036, 034, 035, 047, 058, 059, 060, 061, 051, 052, 027, 028 and 29

5. Project Sponsor's Name and Address: Stover Engineering
Ward Stover, Principal
PO Box 783, Crescent City, CA 95531

6. County Land Use: General Commercial, Multi-Family Residential

7. County Zoning: Planned Community

8. Description of Project:

The owner of the Hidden Creek Subdivision in Crescent City, Hidden Creek, Inc. proposes to increase the permitted density of its 9.95-acre planned community single-family residential subdivision to allow for multiple-family dwelling units. The current planned community entitlement is comprised of 56 single-family residential lots, with six of them currently developed with single-family units. The currently permitted density of the subdivision is 5.63 units per acre. The proposed project includes 44 new duplex units, 5 new three-plex units, and the existing 6 single-family units, creating a total gross density of 10.95 units per acre. The project also includes a small recreation center for tenants on one of the lots. Other standards normally established in a planned community, such as setbacks, lot coverage, building height, etc. are not proposed to change significantly. Residences would not be constructed above 35 feet in total height. As part of a previous approval, the property owner can make a series of minor lot line adjustments throughout the project site. This action better enables the applicant to carry out development of the larger units on each parcel. The smallest parcel in the subdivision would remain approximately 4,441 square feet.

The property is served by a private sewer system that connects to the County Service Area #1 (CSA). City water service is provided. Surface drainage is accounted for in the project proposal.

9. Surrounding Land Uses and Settings:

The affected project area has residential apartment buildings to its immediate west, low density rural residential use to its immediate north and east, and vacant commercial land immediately to its south. Walmart is located approximately 200 feet south of the project area.

10. Required Approvals: Use Permit (Del Norte County Planning Commission)

11. Other Approval (Public Agencies): N/A

12. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, has consultation begun?

Native American tribes, traditionally and culturally affiliated with the project area have been notified of the project application completion and the beginning of the AB 52 consultation period pursuant to PRC §21080.3.1. No requests for consultation pursuant to PRC §21080.3.1 were not received.

Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" without mitigation as indicated by the checklist on the following pages. All mitigation measures are provided in the Mitigation Monitoring and Reporting Program.

☐	Aesthetics	☐	Agriculture and Forestry Resources	☐	Air Quality
☐	Biological Resources	☐	Cultural Resources	☐	Energy
☐	Geology/Soils	☐	Greenhouse Gas Emissions	☐	Hazards & Hazardous Materials
☐	Hydrology / Water Quality	☐	Land Use / Planning	☐	Mineral Resources
☐	Noise	☐	Population / Housing	☐	Public Services
☐	Recreation	☐	Transportation	☐	Tribal Cultural Resources
☐	Utilities / Service Systems	☐	Wildfire	☐	Mandatory Findings of Significance

Determination

On the basis of this initial evaluation:

☐	I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
☒	I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
☐	I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
☐	I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
☐	I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Taylor Carsley

Taylor Carsley

Planner

02/18/2021

Date

Environmental Checklist

1. Aesthetics

Except as provided in Public Resources Code Section 21099, would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) In non-urbanized areas, substantially degrade the existing visual character or public views of the site and its surroundings? (Public views are those that are experienced from publically accessible vantage points). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

Discussion of Impacts

a. The project would have no impact on a scenic vista.
b. The project would not damage scenic resources, as there are no scenic resources on-site.
c. The project would not substantially degrade the existing visual character of the site. The potential to develop multi-family residences in lieu of single-family residences.

2. Agriculture and Forest Resources

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section	☐	☐	☐	☒

12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?				
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

Discussion of Impacts

a. No prime farmland exists on-site.
b. No agricultural zoning exists on-site.
c. No Timber Production zones exist on-site or adjacent to the property
d. The project would not result in the loss of forestland.
e. The project does not involve any other changes in the existing environment that could adversely affect farmland or timberlands.

3. Air Quality

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☐	☐	☐	☒
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
d) Result in other emissions (such as those leading to odors or dust) adversely affecting a substantial number of people?	☐	☐	☐	☒

Discussion of Impacts

a-d. This project would have no foreseeable impacts on the implementation of an air quality plan, on increasing criteria pollutants in the region, on exposing sensitive receptors to pollutant concentrations, nor would it substantially increase emissions beyond that assessed for the original Planned Community approval for single family residences. While there will be increased residential density in the project area as a result of implementation, the number of residential structures being developed will decrease and not create impacts to air quality above that assessed for in the original approval.

4. Biological Resources

Would the project:	Potentially Significant Impact	Less Than Significant Impact with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?	☐	☐	☐	☒

Discussion of Impacts

a-f. The project involves the increase in density of a Planned Community from single family residential use to multiple family residential use. The project site is developed with a circulation system and graded as was approved for the Planned Community. No habitat would be modified as a result of this amendment to the Planned Community. Riparian habitat does not exist on site and the amendment of the existing use permit would not affect the migratory patterns of wildlife. The project would not be in conflict with local ordinances or habitat conservation plans.

5. Cultural Resources

Would the project:	Potentially Significant Impact	Less Than Significant Impact with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource pursuant to § 15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance	☐	☐	☐	☒

of an archaeological resource pursuant to § 15064.5?				
c) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☐	☒

Discussion of Impacts

a-c. No cultural resources are known to exist on-site. The County records were searched for known cultural sites in the general project vicinity, and none were identified. The project is located on a previously heavily disturbed site. Notice was provided to the two tribes traditionally culturally affiliated with the project area and no comment was given with regard to cultural resources. Additionally, cultural staff from the Tolowa-Dee-ni' Nation is a voting member of the County Environmental Review Committee which reviews projects and makes CEQA recommendations. While resources are not known to exist on-site, the possibility of an inadvertent discovery is always possible during construction or other implementation activities associated with the project. The project approval will include an inadvertent discovery condition on the use permit in case cultural resources are discovered.

6. Energy

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☒	☐
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	☒

Discussion of Impacts

a. The project would have no foreseeable impacts on increasing wasteful, inefficient, or unnecessary energy use since no development is proposed as part of this application. The project will use minimal amounts of fuel and energy. The increase in density from single family to multiple family units will increase energy efficiency and consume less land per residential unit.
b. This project does not conflict with nor obstruct a state or local plan for renewable energy or energy efficiency.

7. Geology and Soils

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special	☐	☐	☐	☒

Publication 42.				
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒

Discussion of Impacts

a-f. The project is not anticipated to cause significant impacts including the risk of loss, injury, or death related to soils impacts. The site is flat and has no potential for landslides, mass wasting, or other slope-related impacts. Seismic ground shaking and liquefaction could occur in any region of coastal California, however the potential impacts would be considered less than significant as structural development will be engineered and constructed to current building code. The site is not located on expansive soil as defined in Table 18-1-B and soils will not be utilized for sewage disposal; the project will connect each unit to a private sewer system already developed in the project area. No known paleontological resources or unique geologic features are known to exist on site.

8. Greenhouse Gas Emissions

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☒
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒

Discussion of Impacts

a-b. In 2002, the California legislature declared that global climate change was a matter of increasing concern for the state's public health and environment, and enacted a law requiring the state Air Resource Board (ARB) to control GHG emission from motor vehicles (Health and Safety Code §32018.5 et seq.). CEQA Guidelines define GHG to include carbon dioxide (CO2), nitrous oxide (N2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

The California Global Warming Solutions Act of 2006 (AB 32) definitively established the state's climate change policy and set GHG reduction targets (Health and Safety Code §38500 et seq.). The state has set its target at reducing greenhouse gases to 1990 levels by the year 2020.

Construction of the project may generate GHG emissions as a result of combustion of fossil fuels used in construction equipment. Use of variety of construction materials would contribute indirectly to GHG emissions because of the emissions associated with their manufacture. The construction-related GHG emissions would be minor and short-term and would not constitute a significant impact based on established thresholds.

After construction of the units, it is anticipated that GHG impacts as a result of this Planned Community amendment will actually decrease net emissions. The higher density housing with less unit per acre use will decrease GHG emissions per acre. The project works toward accomplishing statewide climate action goals by developing higher density housing in locations close in proximity to retail, medical, and service markets.

9. Hazards and Hazardous Materials

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
g) Expose people or structures, either directly or indirectly to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒

Discussion of Impacts

a-g. The project would not create a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials. The residential use of the project would limit transportation and use of hazardous

materials to and in the site. The project is not within one quarter mile of a school and is not located on a hazardous materials site identified by the state. The increase in density of the project would not result in a safety hazard or excessive noise due to proximity to an airport. According the 2017 Airport Land Use Compatibility Plan, the project area is outside of any sensitive noise contour. This development would not impair or physically interfere with an adopted emergency response or evacuation plan and is within the Local Responsibility Area for fire response with a low fire hazard severity rating due to surrounding urban and residential uses.

10. Hydrology and Water Quality

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☐	☒
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
i) result in substantial erosion or siltation on-or off-site?	☐	☐	☐	☒
ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;	☐	☐	☐	☒
iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional source of polluted runoff; or	☐	☐	☐	☐
iv) impede or redirect flood flows?	☐	☐	☐	☒
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☒
e) Conflict with or obstruct implementation of a water quality control plan or sustainable ground water management plan?	☐	☐	☐	☒

Discussion of Impacts

a-e. The project amends a Planned Community to entitle each remaining undeveloped lot in the subdivision to construct a multiple-family dwelling unit instead of a single family dwelling unit. This action will not have any impacts on water quality violations, altering drainage patterns, increasing erosion or siltation, or contribute to significant increases in runoff above that which was already permitted. The Drainage Study dated 20 June 2006, prepared for the subdivision and original approval of the Planned Community. This study designed the storm drainage system for high-density single-family units. In an addendum letter prepared by Stover Engineering, the Rational Method for calculation of developed stormwater flows in the subdivision adequately applies to the proposed multi-family unit development, with no further analysis being required since ground conditions are not substantially changing. The amendment of the Planned Community to increase housing types would not increase runoff water which would exceed the capacity of stormwater

drainage systems. The Planned Community will be supplied by public water from the City of Crescent City, making groundwater depletion a non-issue. The project is not in any Special Flood Hazard Area and would not affect flood waters.

11. Land Use and Planning

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Physically divide an established community?	☐	☐	☐	☒
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation of an agency adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

Discussion of Impacts

a-b. This project does not divide an established community nor does it cause a conflict with any land use plan in the County. The proposed project substantially will substantially conform to the General Plan as well as other applicable ordinances and code.

12. Mineral Resources

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

Discussion of Impacts

a-b. No mineral resources are known to exist on site.

13. Noise

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion of Impacts

a-b. The project does not have the potential to generate a significant temporary or permanent increase in ambient noise levels in the vicinity of the project above that approved in the original use permit. The Planned Community already has an entitlement for the development of 56 single family residences and this project would increase the density to allow for six single family and 103 multi-family units. The increase in density would not be expected to contribute to a greater generation of temporary or permanent noise. Temporary noise and vibration will be generated as a result of construction activities, however this is not considered significant nor will it exceed any applicable thresholds.

c. The project is located within two miles of McNamara Field and is within its Airport Influence Area as mapped in the Airport Land Use Compatibility Plan. The project does not fall within any noise contours that would indicate the exposure of the residential use to excessive noise levels generated by the airport.

14. Population and Housing

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Discussion of Impacts

a. The project would not induce substantial unplanned population growth in this area. The current density of the Planned Community is 5.63 units per acre and the proposed density is 10.95 units per acre. The General Plan land use designation in this area is General Commercial and Multi Family Residential which allow for up to 12 and 15 residential units per acre, respectively, when community sewer and water are utilized. No impact would occur as a result of unplanned population growth.
b. The project would not displace any number of existing people or housing. The project would allow an additional 47 residential units to be constructed above that permitted in the current Planned Community use permit.

15. Public Services

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☒	☐
Police protection?	☐	☐	☒	☐
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

Discussion of Impacts

a. The project would not result in substantial adverse impacts associated with the need for new or altered governmental facilities and/or public services. Increased population levels could utilize greater amounts of fire and police resources, however the General Plan acknowledges the potential for this area to be developed at an even higher density. Any impacts to service ratios, response times, or other performance objectives of these public services are expected to be less than significant. School impacts will be less than significant due to construction mitigation fees that would be paid unrelated to mitigation imposed by this project approval. The amendment to the Planned Community proposes a recreation center that would act toward offsetting any impacts on parks as a result of increased population in the area.

16. Recreation

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

Discussion of Impacts

a-b. The project provides alternative recreational facilities for the Planned Community and does not impact existing recreational areas nor does it increase the need for additional recreational facilities.

17. Transportation

Would the project:	Potentially Significant Impact	Less Than Significant Impact with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☒	☐	☐
b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision(b)?	☐	☐	☒	☐
c) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☒	☐	☐
d) Result in inadequate emergency access?	☐	☐	☐	☒

Discussion of Impacts

a. The project does not conflict with any program, plan, ordinance, or policy addressing the circulation system. The Planned Community maintains a private circulation system, maintained by the homeowners association.
b. The project is expected to increase the amount of Vehicle Miles Travelled (VMT) above the accepted threshold in the Del Norte region. The Del Norte Region SB 743 Implementation Plan provides for VMT thresholds and potential mitigation to reduce impacts to less than significant levels. According to the Transportation Impact and Mitigation Calculations submitted by the applicant, the addition of 105 multi-family units (31 single family home equivalent) will add approximately 297 average daily trips (ADT), exceeding the threshold of 110 ADT. The SB 743 Implementation Plan provides for a VMT mitigation cost of 0.5 curb ramps, 15 feet of sidewalk, or 7.5 feet of sidewalk with curb and gutter per single family home equivalent. According to these costs, the applicant could reduce the impact of creating 187 ADT by installing 236 feet of sidewalk. See Mitigation Measure TRANS-1.

Mitigation Measure TRANS-1

The applicant shall mitigate the VMT producing impacts of 31.42 equivalent single family residences prior to final buildout of the Planned Community consistent with the Del Norte Region SB 743 Implementation Plan. Mitigation could consist of 16 curb ramps, 471 feet of sidewalk, or 236 feet of sidewalk with curb and gutter, or a combination deemed appropriate by the Community Development Department (CDD). An increase of up to 25% in the area of the improvement may be required by the CDD to assist with gap closures at the mitigation site. Equivalent mitigation shall be fully constructed for each dwelling unit prior to each dwelling unit being issued a Certificate of Occupancy. Prior to issuance of the use permit, the applicant shall submit engineered improvement plans to mitigate the total VMT impacts created by 31.42 equivalent single family residences. The applicant must work with the CDD to identify a public mitigation site(s). The County of Del Norte is unwilling to accept a payment in lieu of the construction of the physical improvements required to mitigate VMT.

Timing/Implementation: Condition on use permit.
Enforcement: County Community Development Department.

Monitoring: Annually up to final buildout of Planned Community.

c. The project would not change any design features or introduce incompatible usage to an existing design feature.
d. The project would not result in inadequate emergency access. The Planned Community has a circulation system that includes 40-foot private right-of-ways which opens up to Summer Lane, a 60-foot wide County-maintained right-of-way.

18. Tribal Cultural Resources

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	☒
ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒

Discussion of Impacts

No cultural resources are known to exist on-site. The County records were searched for known cultural sites in the general project vicinity, and none were identified. The project is located on a previously heavily disturbed site. Notice was provided to the two tribes traditionally culturally affiliated with the project area and no comment was given with regard to cultural resources. Additionally, cultural staff from the Tolowa-Dee-ni' Nation is a voting member of the County Environmental Review Committee which reviews projects and makes CEQA recommendations. While resources are not known to exist on-site, the possibility of an inadvertent discovery is always possible during construction or other implementation activities associated with the project. In this case, an inadvertent discovery condition will be added to the use permit to address any

19. Utilities and Service Systems

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, or stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☐	☒
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal,	☐	☐	☐	☒

dry and multiple dry years?				
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the providers existing commitments?	☐	☐	☐	☒
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☐	☒
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☐	☒

Discussion of Impacts

a-e. The project would not have any impact on utilities and service systems. The applicant has submitted materials showing that no significant impacts would occur as a result of public services needed at the project site. The project would utilize a private sewer system that connects to the CSA. The sewer system would be capable of handling increased loading from a higher density development. The peak flow rate of the Planned Community would be approximately 80 gallons per minute. The sewer pipe will be able to carry approximately 250 gallons per minute. Water is supplied by the City of Crescent City. Domestic water is carried through 12-inch main lines and no shortages or lack of water pressure is anticipated. The increase in residential density will create a higher solid waste generation rate, however not in excess of established thresholds.

20. Wildfire

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☐	☒
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	☒

Discussion of Impacts

a-d. The project site is located in a Local Responsibility Area for fire management and in a Moderate Fire Hazard Area. The Planned Community would increase growth in an area has planned for it through the General Plan land use

designation, however it is not in a wildland area. The topography of the site is flat with a lack of wildland vegetation which would require mitigation for issues associated with rapid wildfire movement or an excess of fuels. No other significant wildfire risk exists as a result of this project.

21. Mandatory Findings of Significance

Would the project:	**Potentially Significant Impact**	**Less Than Significant Impact with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☒
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	☒
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

The project does not have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife species to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory. Additionally, the project does not have impacts that are individually limited but cumulatively considerable and does not have environmental effects which will cause substantial adverse effects on human beings directly nor directly.

Mitigation Monitoring Plan

Transportation

Mitigation Measure TRANS-1

The applicant shall mitigate the VMT producing impacts of 31.42 equivalent single family residences prior to final buildout of the Planned Community consistent with the Del Norte Region SB 743 Implementation Plan. Mitigation could consist of 16 curb ramps, 471 feet of sidewalk, or 236 feet of sidewalk with curb and gutter, or a combination deemed appropriate by the Community Development Department (CDD). An increase of up to 25% in the area of the improvement may be required by the CDD to assist with gap closures at the mitigation site. Equivalent mitigation shall be fully constructed for each dwelling unit prior to each dwelling unit being issued a Certificate of Occupancy. Prior to issuance of the use permit, the applicant shall submit engineered improvement plans to mitigate the total VMT impacts created by 31.42 equivalent single family residences. The applicant must work with the CDD to identify a public mitigation site(s). The County of Del Norte is unwilling to accept a payment in lieu of the construction of the physical improvements required to mitigate VMT.

Timing/Implementation: Condition on use permit.
Enforcement: County Community Development Department.
Monitoring: Annually up to final buildout of Planned Community.

PROJECT INFORMATION SUPPLEMENT

PC USE PERMIT AMENDMENT

HIDDEN CREEK SUBDIVISION – PHASE I

10 February 2021

This supersedes the Information Supplement dated 28 September 2020.

Use Permit Amendment

Current Project - 56 single family residences or zero lot line residential units located on 56 individual parcels within a PC Zoning District as follows:

APN 116-310-001 to 036, 039 to 041, 044 to 052, 055 to 056, 058 to 063
Gross Area including Streets: 9.95 Acres
Gross Density: 5.63 residential units/acre

Proposed Project – Refer to the attached Proposed Multi-Family Layout Plan. The project includes 6 single family residences previously constructed, a recreation center for tenants, 44 duplexes plus 5 three-plex multifamily parcels as follows:

Recreation Center: APN 116-310-062
Single-Family Parcels: APN 116-310-003 to 006, 056, & 063.
Duplex Parcels: APN 116-310-001, 002, 007 to 009, 012 to 018, 020 to 035, 039 to 041, 044 to 047, 049 to 052, 055, & 058 to 061.
Three-plex Parcels: APN 116-310-010, 011, 019, 036, & 048
Total Residential Units: 6 Single-Family, 103 Multi-Family
Gross Density: 10.95 residential units/acre

There are five proposed standard plans to be used for the project. See the attached footprints and elevations (3 Sheets). The footprint and height may be adjusted from the standard plan, or a similar plan may be used, but will not exceed the currently approved building setbacks and will not exceed a height of 35 feet.

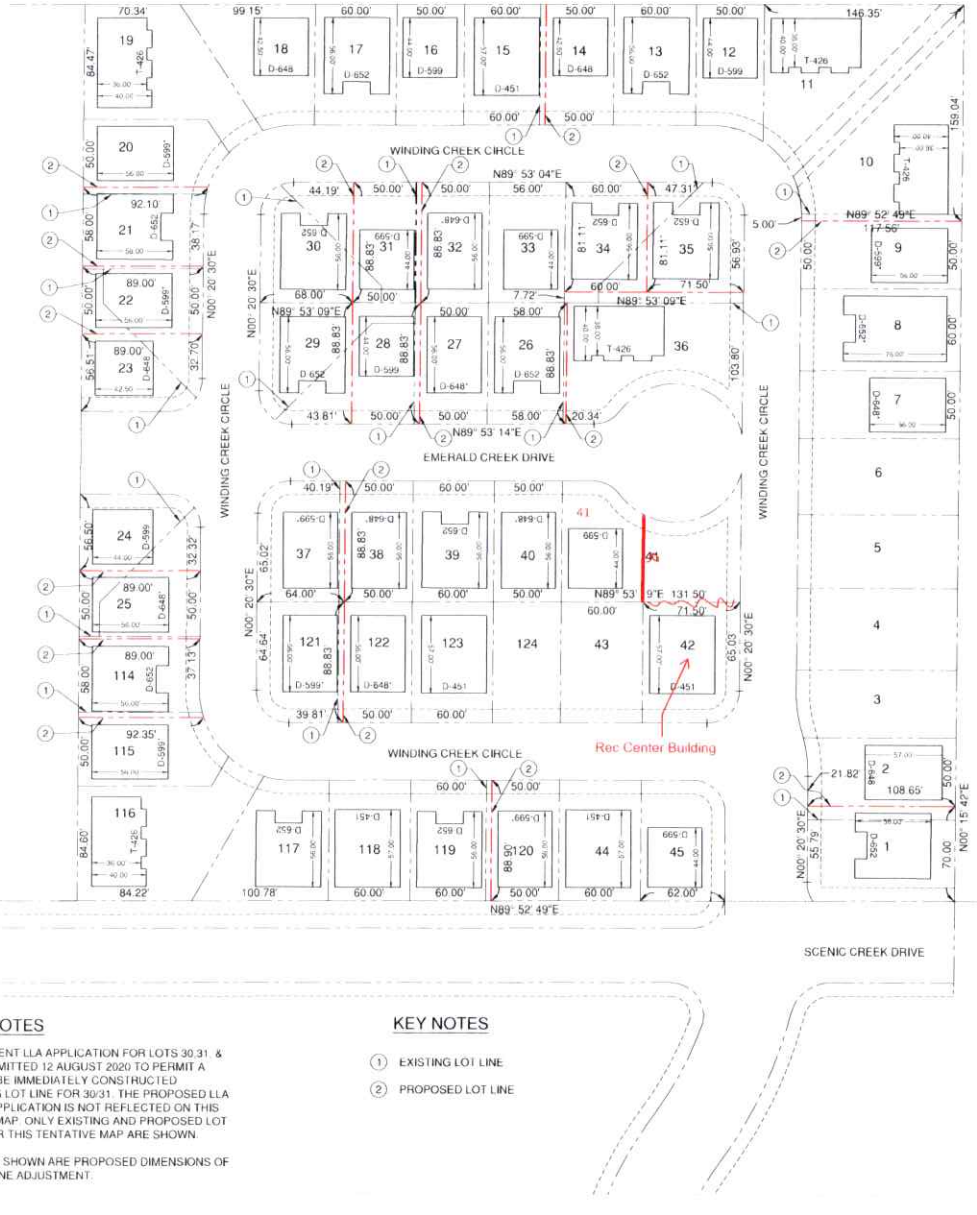
The preliminary plan and footprint for the recreation center is not developed but will conform to the architectural theme of the residences. Setbacks will conform to the setbacks for the remainder of the project.

Boundary Adjustment

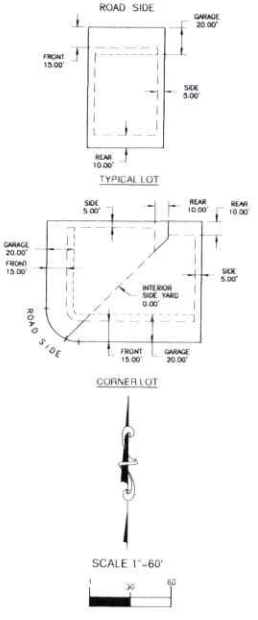
Refer to the attached Proposed Boundary Adjustment Plan. To accommodate the proposed duplex and three-plex units the following parcels will be affected by a boundary adjustment:

APN 116-310-001, 002, 009, 010, 014, 015, 020 to 032, 034 to 036, 046, 047, 051, 052, & 058 to 061.

Currently, the smallest parcel size within the subdivision is 4441.5 square feet. As proposed, the smallest parcel size remains unchanged.



SETBACK REQUIREMENTS



PROPOSED DUPLEX LAYOUT PLAN OF HIDDEN CREEK SUBDIVISION FOR HIDDEN CREEK INC IN

SW 1/4 S16 T16N R1W HM
IN THE UNINCORPORATED AREA OF
COUNTY OF DEL NORTE
STATE OF CALIFORNIA

PROJECT NOTES

1. A CONCURRENT LLA APPLICATION FOR LOTS 30,31 & 32 WAS SUBMITTED 12 AUGUST 2020 TO PERMIT A DUPLEX TO BE IMMEDIATELY CONSTRUCTED STRADDLING LOT LINE FOR 30/31. THE PROPOSED LLA FOR THAT APPLICATION IS NOT REFLECTED ON THIS TENTATIVE MAP. ONLY EXISTING AND PROPOSED LOT LINES UNDER THIS TENTATIVE MAP ARE SHOWN.
2. DIMENSIONS SHOWN ARE PROPOSED DIMENSIONS OF FINAL LOT LINE ADJUSTMENT.

KEY NOTES

(1) EXISTING LOT LINE
(2) PROPOSED LOT LINE

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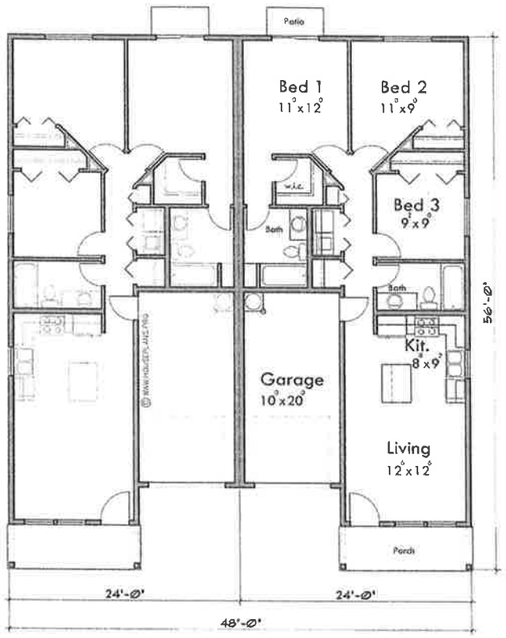
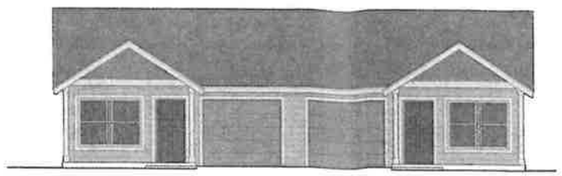
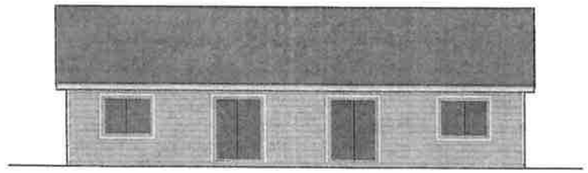
JN 4695



FLOOR PLAN



FRONT ELEVATION



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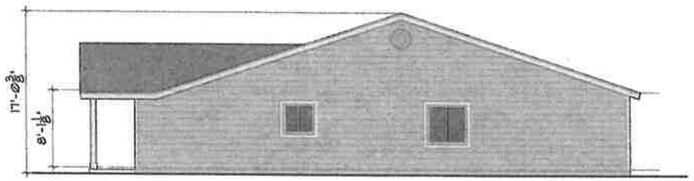
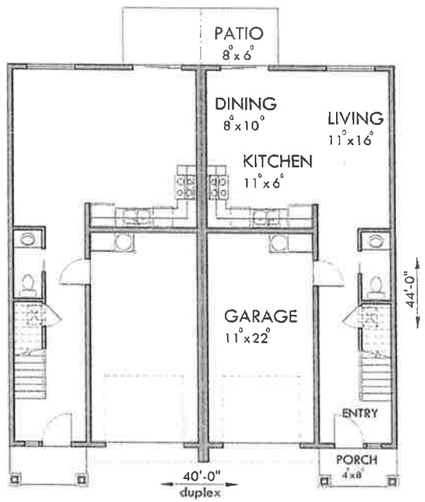


SIDE ELEVATION

1 / - D-652 (48' WIDE)
1/8" = 1'



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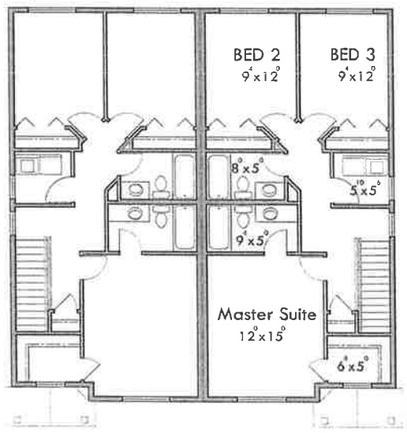
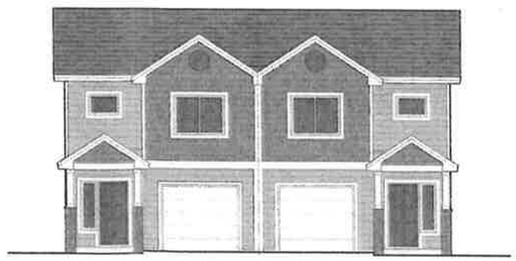


SECOND FLOOR PLAN



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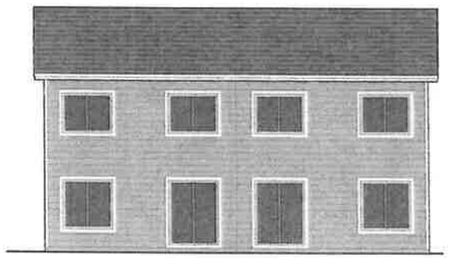

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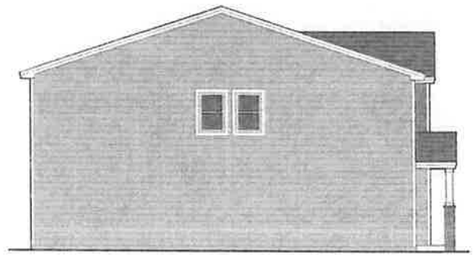

SIDE ELEVATION

2 / - D-599 (40' WIDE)
1/8" = 1'

SAMPLE PLANS & ELEVATIONS FROM 3RD PARTY DESIGNER

No.	Date	Revision	Aprvd.

DRAWING INFO: DESIGNED BY:ACY DRAWN BY:GLH CHECKED BY:MLS

1 BAR IS EQUAL TO ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES IF DISTANCE VARIES ACCORDINGLY

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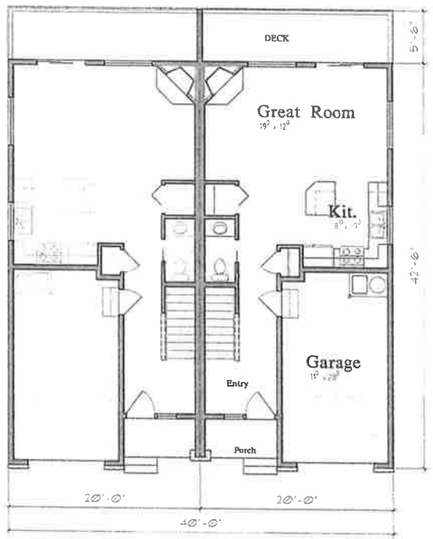
HIDDEN CREEK INC
HIDDEN CREEK MULTIFAMILY
CRESCENT CITY, CA

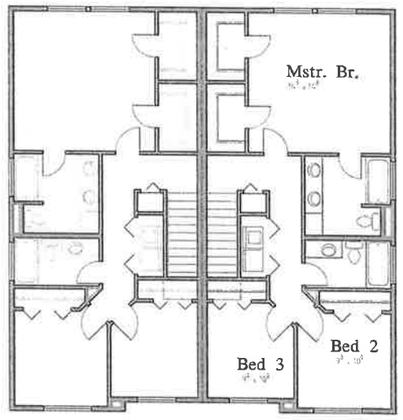
PROPOSED FLOOR PLANS AND ELEVATIONS

JOB NO. 4695
SCALE: 1/8" = 1'
DATE: 09/28/20
SHEET 1

S:\4695 Hidden Creek Inc Duplexes\CIVIL 3D\DWG\20200806 - 4695 - Building layout.dwg

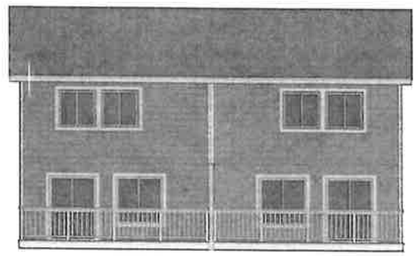


FIRST FLOOR PLAN



SECOND FLOOR PLAN

FRONT ELEVATION



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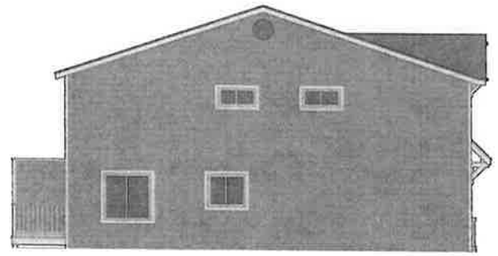
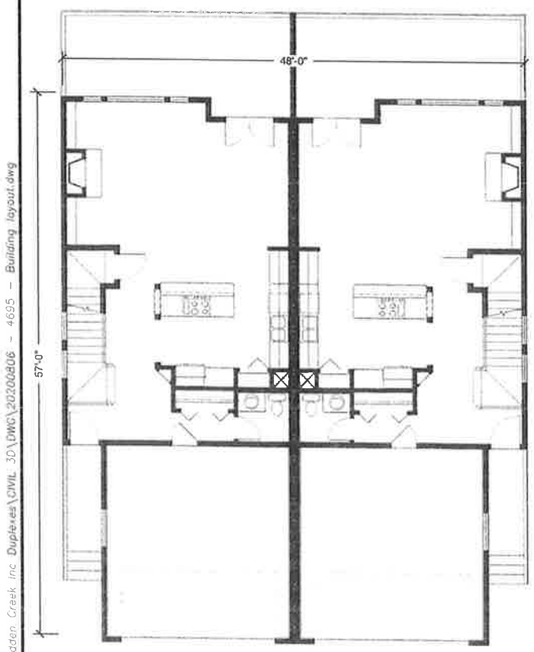
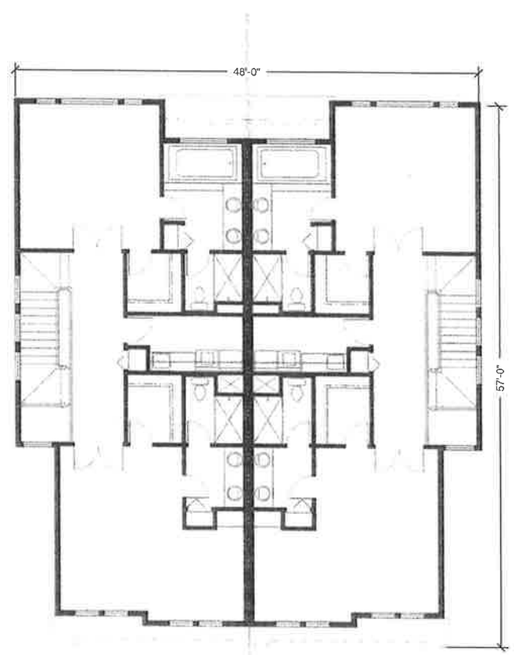


SIDE ELEVATION

3 / - D-648 (40' WIDE)
1/8" = 1'



FIRST FLOOR PLAN

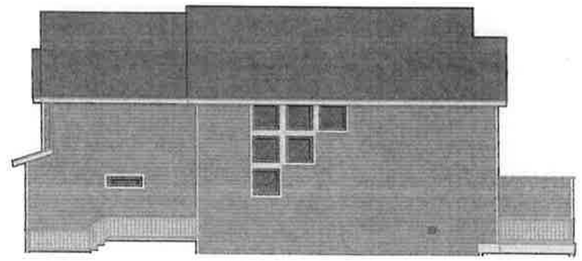


SECOND FLOOR PLAN

4 / - D-451 (48' WIDE)
1/8" = 1'

FRONT ELEVATION

REAR ELEVATION



SIDE ELEVATION

SAMPLE PLANS & ELEVATIONS FROM 3RD PARTY DESIGNER

No.	Date	Revision	Aprvd.

DRAWING INFO: DESIGNED BY:ROY DRAWN BY:GLH CHECKED BY:WLS

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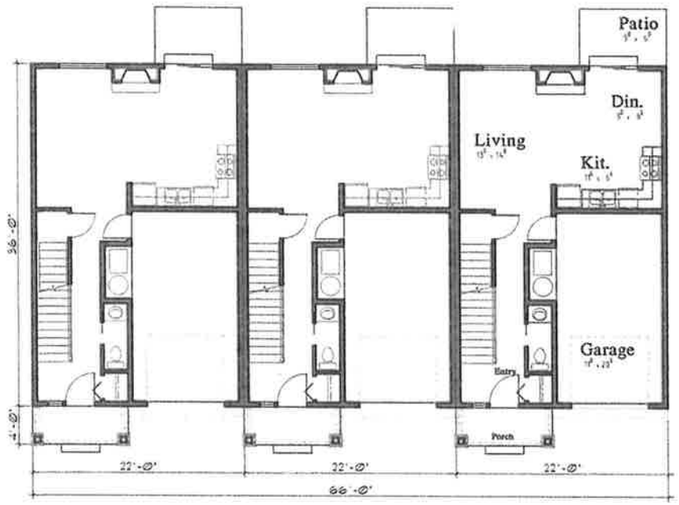
HIDDEN CREEK MULTIFAMILY
CRESCENT CITY, CA

PROPOSED FLOOR PLANS AND ELEVATIONS

JOB NO. 4695
SCALE: 1/8" = 1'
DATE: 09/28/20
SHEET
2



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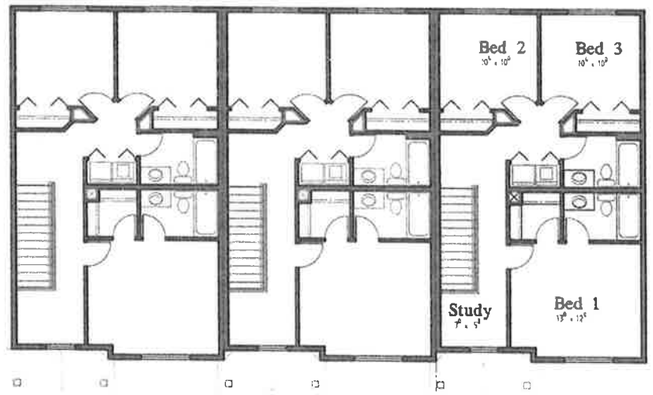

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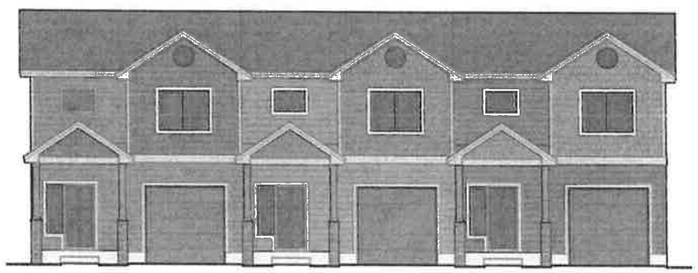

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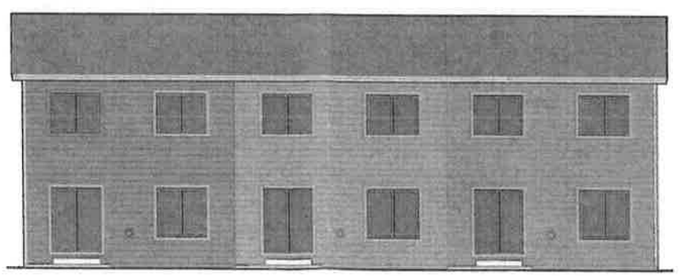
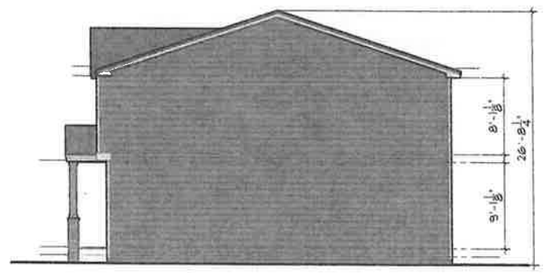


REAR ELEVATION



SIDE ELEVATION

5 T-426 (66' WIDE)
1/8" = 1'

SAMPLE PLANS & ELEVATIONS FROM 3RD PARTY DESIGNER

No.	Data	Revision	Aprvd.

DRAWING INFO: DESIGNED BY:RCY DRAWN BY:GLH CHECKED BY:WLS

1 BAR IS EQUAL TO ONE INCH ON ORIGINAL DRAWING. ADJUST SCALES IF DISTANCE VARIES ACCORDINGLY

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HIDDEN CREEK INC
HIDDEN CREEK MULTIFAMILY
CRESCENT CITY, CA

PROPOSED FLOOR PLANS AND ELEVATIONS

JOB NO. 4695
SCALE: 1/8" = 1'
DATE: 09/28/20
SHEET
3

Hidden Creek of Crescent City
Utilities Study for Duplexes
July 20, 2020

The purpose of this study is to explore the existing utilities, in the Hidden Creek Subdivision, and determine if those utilities are of adequate capacity to serve duplexes instead of singe family homes.

Water

The domestic water for this subdivision is served by the City of Crescent City. Water presssure is about 70 psi. The subdivision placed a 12" water line from the connection in Summer Lane through the subdivision to facilitate future connection in Cummins Drive and Northcrest Drive. This 12" backbone feeds 6" lines that loop back into the 12" line. This heavy backbone system assures the subdivision of adequate source for domestic use as well as fire protection.

The existing house services are either a dual service from the main or a single service. To accommodate duplex lots the City is recommending adding a second meter for each lot. That will require removing and replacing portions of sidewalk to add meters. We are now investigating the service size for the duplex meters to determine if a one inch line was installed or a three quarter inch. If a three quarter inch service line serves the duplex meters a one inch line will have to be installed, replacing the three quarter inch line.

Sanitary Sewer System

The County CSA provides sewer service to this development. An eight-inch pipe in Summer Lane was used to drain sewage from this area. This development connected into that eight-inch line and extended that pipe to where the cul-de-sac intersects with Winding Creek Circle. From there six -inch lines go both north and west to service those areas. The six-inch pipe draining west also serves the Summer Park Apartments. The only pipe with very many units is the pipe extending west. That carries all of the Summer Park Apartments and thirteen lots in Hidden Creek. Summer Park at buildout will have 156 units. Each of those units is considered 0.6 single family equivalents. That would give us a total of 94 sfe's. Duplexes are considered to have 1.5 sfe's for each two-unit building. That is 13 lots times two units' times 0.75 per unit or 20 units. That gives us a total of 114 sfe's into the six-inch pipe. The six-inch pipe is sloped at 0.50 percent and therefore has a capacity of 250 gallons per minute. The Crescent City system has an average flow rate per sfe of 250 gallons per day. We will use a peaking factor of four for this study. The total flow rate for the west line is therefore 114 sfe's times 250 gallons per day times a peaking factor of four divided by 24 hours in a day and then divided by 60 minutes in an hour. The total for that calculation is 80 gallons per minute. Since the pipe will carry 250

gallons per minute there is plenty of capacity in the sanitary sewer piping system within the subdivision.

The sewer line in Summer Lane is also an eight-inch line. That line drains into a lift station in the Crescent Ace Hardware parking lot. Consulting with the county it was determined one pump runs approximately fifty minutes per day and the second pump about fifty five minutes. Since these pumps could be running three times as long the addition of twenty-five sfe's will not affect the pump station.

STOVER ENGINEERING

Transportation Impact and Mitigation Calculations

Job Number 4695
Calc By GBG
Checked By WHS

PROJECT: Hidden Creek Subdivision - Phase I

01 - Project Size Determination

	Existing Project	Proposed Project	*ITE Trip Generation Manual, 10th Ed*
Single-Family Homes	56	6	(9.44 ADT per Home)
Multifamily Units (Low-Rise)	0	105	(7.32 ADT per Unit)
Multifamily Units (Mid-Rise)	0	0	(3.44 ADT per Unit)
Total Average Daily Trips (ADT)	529	825	ADT
Equivalent Single-Family Homes	56	87	Homes

Added ADT: 297

Mitigation Triggered if ADT > 110

Net Change (H): 31 Homes

02 - Mitigation Requirements

Mitigation May Consist of One of These Items Alone or a Fractional Combination Thereof - See Step 03

Curb Cuts / Ramps	16	ea	(H*0.5)
-or-			
Sidewalk, no Curb & Gutter	471	ft	(H*15)
-or-			
Sidewalk, with Curb & Gutter	236	ft	(H*7.5)
Equivalent Mitigation Cost, C =	$40,059.85	2020 USD	(H*$1275)
Max. Cost w/ Gap Closure, C_{MAX} =	$50,074.81	2020 USD	(C*1.25)

REGISTERED PROFESSIONAL ENGINEER
LEONARD STOVER
No. 44207
Expires 6-30-21
CIVIL
STATE OF CALIFORNIA
9-28-20

03 - Proposed Mitigation Project

Number of Curb Ramps, R =	0	ea
Length Sidewalk No Curb, P =	0	ft
Length Sidewalk w/ Curb, S =	236	ft

A PROJECT MITIGATING 31.42 EQ SFR WILL BE IDENTIFIED.

Eq. Homes Provided:

Provided by Curb Ramps	0.00	(R/0.5)
Provided by Sidewalk No Curb	0.00	(P/15)
Provided by Sidewalk With Curb	31.47	(S/7.5)

Equivalent Single-Family Homes	Provided	Required	Remaining
	31.47	31.42	-0.05

Project Mitigated? YES

Adjust proposed mitigation measures until "Remaining" value is at or below zero.

Gap closure may increase the total mitigation items by up to 25% at the discretion of the Lead Agency.

Calculations based on SB 743 Implementation Plan, Del Norte County, June 2020

STOVER ENGINEERING

Civil Engineers and Consultants

[illegible]

ROSANNA BOWER, PE - ASST COUNTY ENGINEER
COUNTY OF DEL NORTE
981 H ST SUITE 110
CRESCENT CITY CA, 95531

Job Number: 4695

23 October 2020

RE: Stormwater Runoff in Hidden Creek Subdivision

Dear Rosanna,

This letter provides an opinion regarding the stormwater runoff generated by the proposed duplex units in Hidden Creek Subdivision. Please refer to the attached Drainage Study dated 20 June 2006 prepared by Stover Engineering for this subdivision. It was previously referred to as The Pointe RBS Major Subdivision. The report was accepted by the County Engineer supporting the storm drainage design for the high-density single-family unit project at the time. It is my opinion that the assumptions used in the Drainage Study adequately applies to the proposed duplex development as well and no further analysis is required.

The Study utilizes the Rational Method for calculation of developed stormwater flows in the subdivision. The following is an excerpt from the *Stormwater Collection Systems Design Handbook (Mays, 2001):*

> *The runoff coefficient, C, is selected from an appropriate table. It represents the decimal fraction of event rainfall that becomes runoff. The justifications for values in these tables seem to have been lost to posterity, so election of a particular table and a particular value from a table is a highly subjective matter. Table 4.3 is taken from California Department of Transportation Highway Design Manual, Chapter 810....*

The range for the composite runoff coefficient in the Caltrans Highway Design Manual for single-family residential development is 0.30 to 0.50. The conservative value of 0.50 was used in the 2006 Drainage Study. The Highway Design Manual lists a coefficient range of 0.40 to 0.60 for multi-family detached residential development. Apartment dwelling units have a recommended range of 0.50 to 0.70. It is my opinion that the composite runoff coefficient of 0.50 is adequate to model the stormwater flows for the proposed duplex development in the Hidden Creek Subdivision. Therefore, the previously accepted Drainage Study should suffice.

I trust this provides the drainage documentation you need for the proposed project. Feel free to contact me should you have any questions.

REGISTERED PROFESSIONAL ENGINEER
WARD LEONARD STOVER
No. 44207
Expires 6-30-21
CIVIL
STATE OF CALIFORNIA

Very truly yours,
STOVER ENGINEERING

Ward L. Stover, PE
Principal

Attachment
QA/QC RLY

S:\4695 Hidden Creek Inc Duplexes\Drainage Opinion Letter 20201023.docx

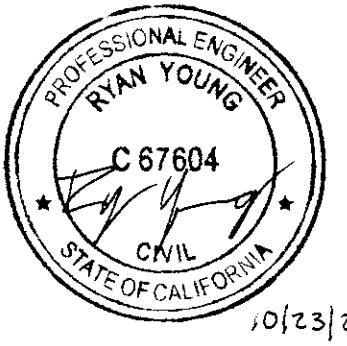
DRAINAGE STUDY

FOR

THE POINTE
RBS MAJOR SUBDIVISION
APN 116-270-80

Crescent City, CA

20 June 2006



10/23/20

PREPARED
FOR

RBS LLC
WASHINGTON BLVD/SUMMER LANE LLC

BY

STOVER ENGINEERING
711 H St
Crescent City, CA 95531

JN 3824

TABLE OF CONTENTS

INTRODUCTION

This report presents final drainage concepts for the construction of The Pointe Subdivision; APN 116-270-80, which is located off of Washington Blvd., north of the existing end of Summer Lane. . The west side of the subdivision is flat, cleared, undeveloped land that is bounded on the westerly and southerly sides generally by commercially developed properties. The north side is bounded by flat, cleared, undeveloped lands, and an existing urban mobile home park and residential areas. Undeveloped commercial lots border the southeasterly side of the subdivision.

The topographic data presented was provided by a topographic survey conducted by Stover Engineering on 3 April 2006. The topography of the west side of the subdivision shown is generally flat and most of the runoff from the area drains generally to the east side of the property, where it is collected in an existing drainage channel that conveys the flow into Elk Creek located to the east of the parcel. The southwest portion of the subdivision drains generally towards Summer Lane, into the public right-of-way where it is intercepted by a storm water collection system. The remaining portion of the west side then drains generally off-site in the westerly directions. An open drainage ditch exists on the east edge of Parcel 1, where runoff from the north and the west is collected and conveyed into the existing creek.

METHODOLOGY

Del Norte County requires that drainage improvements for Northcrest Drive be adequately sized for runoff from the 25 year storm event. The following rational method formula is used to compute the storm runoff values:

$$Q = CIA$$

Where Q = Storm runoff in cubic feet per second

C = Runoff Coefficient

I = Rainfall Intensity (per Del Norte County intensity-duration-frequency curves)

A = Basin Area in Acres

The rainfall intensity is based on the 1-hour precipitation calculated from the intensity-duration-frequency (IDF) curves for Del Norte County from the Caltrans Hydraulics Department. Runoff coefficients are derived from Figure 819.2b of the Caltrans Highway Design Manual.

HISTORIC HYDROLOGY

Two historic drainage basins were identified to the north of the project site which produce runoff that enters the project site at two locations along the north boundary. These basins are identified as H6 and H4 on the drainage map. They are approximately 4.9 acres each. The basins were analyzed as part of the minor subdivision of Assessor's Parcel #116-270-80, which preceded this project. The runoff from basin H6 and H4 were calculated as 1.0 cfs and 0.5 cfs respectively in the current undeveloped condition.

PROPOSED HYDROLOGY

For design purposes, the entire subdivision is divided into twenty-one drainage sub-basins labeled A1 through A21 as indicated on the drainage map. The sub-basins were sized so that the runoff from each basin does not exceed the design gutter capacity of 1.6 cfs. This criteria maintains a flooded width of 8 feet from face of curb in the residential streets. This provides for two inundated traffic lanes during the 10-year storm event.

The time of concentration for each sub-basin is included in the Appendix. The 10-year hydrology calculations are also included which shows how the runoff from each sub-basin is routed through the subdivision.

HYDRAULICS

Hydraflow® Stormsewer® computer software was utilized to design the storm drain system. The storm drain system design follow criteria set by Del Norte County, including maintaining one foot of freeboard within the inlets and manholes during the 10-year storm event. Additionally, the minimum storm drain size is 18". The storm drain collection system utilized High Density Poly-Ethylene pipe. The system outfalls to the existing drainage ditch. Previous studies have illustrated that this ditch has a capacity of approximately 280 cfs. This far exceeds the runoff generated by the 10-year storm event.

CONCLUSION

Currently the existing grading as indicated on the drainage map generally provides adequate drainage for the subdivision without creating impacts for adjoining or downstream properties.

Due to the fact that all of the proposed roads are sloped to the outfall point designated as design points A1 and A3 on the Drainage Map, any storm runoff is directed away from the properties during a storm event larger than the 10-year event. Should an emergency condition occur, such as a clogged out fall line or inlet, runoff is directed to the historic location east of the property.

Attached are the hydrology and hydraulic calculations for the storm drain system as well as the drainage map.

Table 819.2B

Runoff Coefficients for Developed Areas

Type of Drainage Area	Runoff Coefficient
Business:	
Downtown areas	0.70 - 0.95
Neighborhood areas	0.50 - 0.70
Residential:	
Single-family areas	0.30 - 0.50
Multi-units, detached	0.40 - 0.60
Multi-units, attached	0.60 - 0.75
Suburban	0.25 - 0.40
Apartment dwelling areas	0.50 - 0.70
Industrial:	
Light areas	0.50 - 0.80
Heavy areas	0.60 - 0.90
Parks, cemeteries:	0.10 - 0.25
Playgrounds:	0.20 - 0.40
Railroad yard areas:	0.20 - 0.40
Unimproved areas:	0.10 - 0.30
Lawns:	
Sandy soil, flat, 2%	0.05 - 0.10
Sandy soil, average, 2-7%	0.10 - 0.15
Sandy soil, steep, 7%	0.15 - 0.20
Heavy soil, flat, 2%	0.13 - 0.17
Heavy soil, average, 2-7%	0.18 - 0.25
Heavy soil, steep, 7%	0.25 - 0.35
Streets:	
Asphaltic	0.70 - 0.95
Concrete	0.80 - 0.95
Brick	0.70 - 0.85
Drives and walks	0.75 - 0.85
Roofs:	0.75 - 0.95

RUNOFF COEFFICIENT FOR THE POINTE SUBDIVISION

The Regional Flood-Frequency equations are applicable only to sites within the flood-frequency regions for which they were derived and on streams with virtually natural flows. For example, the equations are not generally applicable to small basins on the floor of the Sacramento and San Joaquin Valleys as the annual peak data which are the basis for the regression analysis were obtained principally in the adjacent mountain and foothill areas. Likewise, the equations are not directly applicable to streams in urban areas affected substantially by urban development. In urban areas the equations may be used to estimate peak discharge values under natural conditions and then by use of the techniques described in the publication or HDS No. 2, adjust the discharge values to compensate for urbanization. Further limitations on the use of USGS Regional Flood-Frequency equations are:

Region	Drainage Area (A) mi^2	Mean Annual Precip (P) in.	Altitude Index (H) 1000 ft.
North Coast	0.2-3000	19-104	1.0-5.7
Northeast	0.2-25	all	all
Sierra	0.2-9000	7-85	0.1-9.7
Central Coast	0.2-4000	8-52	0.1-2.4
South Lahontan-Colorado Desert	0.2-25	all	all

Note: Values shown in table have not been converted to metric system.

TIME OF CONCENTRATION
RBS SUBDIVISION

JN 3824
04/25/06

3 DATA			INITIAL/OVERLAND TIME (T_i)				TRAVEL TIME (T_t)				FINAL T_c	REMARKS
DESIGN:	AREA Ac	C_{10}	LENGTH Ft	SLOPE %	VEL. FPS	T_i	LENGTH Ft	SLOPE %	VEL. FPS	T_t	T_c	
A1	0.3	0.95	600	2.0%	0.9	11.4	45	0.5%	0.4	1.7	13.1	Street
A2	4.8	0.95	1025	2.0%	0.7	24.6	35	0.5%	0.4	1.3	25.9	Commercial
A3	2.0	0.50	90	2.0%	0.7	2.2	300	0.5%	0.4	11.4	13.6	Residential
A4	1.5	0.50	90	2.0%	0.7	2.2	350	0.5%	0.4	13.3	15.5	Residential
A5	1.0	0.50	90	2.0%	0.7	2.2	380	0.5%	0.4	14.5	16.6	Residential
A6	0.7	0.50	90	2.0%	0.7	2.2	300	0.5%	0.4	11.4	13.6	Residential
A7	1.1	0.50	90	2.0%	0.7	2.2	350	0.5%	0.4	13.3	15.5	Residential
A8	0.8	0.50	90	2.0%	0.7	2.2	360	0.5%	0.4	13.7	15.9	Residential
A9	1.1	0.50	90	2.0%	0.7	2.2	525	0.5%	0.4	20.0	22.1	Residential
A10	1.0	0.50	90	2.0%	0.7	2.2	300	0.5%	0.4	11.4	13.6	Residential
A11	0.5	0.50	90	2.0%	0.7	2.2	200	0.5%	0.4	7.6	9.8	Residential
A12	1.0	0.50	90	2.0%	0.7	2.2	400	0.5%	0.4	15.2	17.4	Residential
A13	1.0	0.50	90	2.0%	0.7	2.2	375	0.5%	0.4	14.3	16.4	Residential
A14	1.2	0.50	90	2.0%	0.7	2.2	400	0.5%	0.4	15.2	17.4	Residential
A15	1.0	0.50	90	2.0%	0.7	2.2	480	0.5%	0.4	18.3	20.4	Residential
A16	1.3	0.50	90	2.0%	0.7	2.2	400	0.5%	0.4	15.2	17.4	Residential
A17	1.3	0.50	90	2.0%	0.7	2.2	400	0.5%	0.4	15.2	17.4	Residential
A18	1.0	0.50	90	2.0%	0.7	2.2	400	0.5%	0.4	15.2	17.4	Residential
A19	1.2	0.50	90	2.0%	0.7	2.2	400	0.5%	0.4	15.2	17.4	Residential
A20	0.8	0.50	90	2.0%	0.7	2.2	200	0.5%	0.4	7.6	9.8	Residential
A21	0.8	0.50	90	2.0%	0.7	2.2	200	0.5%	0.4	7.6	9.8	Residential
H6	4.9	0.50									15.0	Future - Assumed Tc
H4	4.9	0.5									20.0	Future - Assumed Tc

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

CALCULATED BY: RCY
DATE: 6/7/2006
CHECKED BY:

PROJECT: The Pointe
JN: 3824
DESIGN STORM: 10-Year

Negative flow indicates flow into storm sewer.

STREET	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
	DESIGN POINT	AREA DESIG.	AREA (Ac)	RUNOFF COEFF.	tc (min)	CA (Ac)	I (in/hr)	Q (cfs)	tc (min)	CA (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Flow (cfs)	Flow (cfs)	Slope (%)	Size (in)	Length (ft)	Velocity (fps)	tt (min)	
BASIN A21	A21	A21	0.8	0.5	9.8	0.40	2.3	0.9													
COMBINE BASIN A20	A20	A20	0.8	0.5	9.8	0.40	2.3	0.9	9.8	0.80	2.3	1.8									
INLET AT A20												-1.8									
BASIN A14	A14	A14	1.2	0.5	17.4	0.60	1.7	1.0													
INLET AT A14	A14							-1.0													
BASIN A15	A15	A15	1.0	0.5	20.4	0.50	1.6	0.8													
INLET AT A15								-0.8													
BASIN A13	A13	A13	1.0	0.5	16.4	0.50	1.8	0.9													
COMBINE A11	A13	A11	0.5	0.5	9.8	0.25	2.3	0.6	16.4	0.75	1.8	1.3									
INLET AT A13	A13											-1.3									
BASIN A16	A16	A16	1.3	0.5	17.4	0.65	1.7	1.1													
INLET AT A16	A16							-1.1													
BASIN A18	A18	A18	1.0	0.5	17.4	0.50	1.7	0.9													
INLET A18	A18							-0.9													
BASIN A17	A17	A17	1.3	0.5	17.4	0.65	1.7	1.1													
INLET AT A17	A17							-1.1													
BASIN A19	A19	A19	1.2	0.5	17.4	0.60	1.7	1.0													
INLET A19	A19							-1.0													

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

CALCULATED BY: RCY
DATE: 6/7/2006
CHECKED BY: _____

PROJECT: The Pointe
JN: 3824
DESIGN STORM: 10-Year

Negative flow indicates flow into storm sewer.

STREET	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
	DESIGN POINT	AREA DESIG.	AREA (Ac)	RUNOFF COEFF.	tc (min)	CA (Ac)	I (in/hr)	Q (cfs)	tc (min)	CA (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Flow (cfs)	Flow (cfs)	Slope (%)	Size (in)	Length (ft)	Velocity (fps)	tt (min)	
COMBINE BASIN A12	A12	A12	1.0	0.5	17.4	0.50	1.7	0.9													
INLET AT A12	A12							-0.9													
BASIN A4	A4	A4	1.5	0.5	15.5	0.75	1.8	1.4													
INLET AT A4	A4							-1.4													
COMBINE BASIN A3	A3	A3	2.0	0.5	13.6	1.00	2.0	2.0													
INLET AT A3	A3							-2.0													
BASIN A9	A9	A9	1.1	0.5	22.1	0.55	1.6	0.9													
COMBINE BASIN A8	A8	A8	0.8	0.5	15.9	0.40	1.8	0.7	22.1	0.95	1.6	1.5									
INLET AT A8/A9	A8/A9											-1.5									
BASIN A7	A7	A7	1.1	0.5	15.5	0.55	1.8	1.0													
COMBINE BASIN A10	A10	A10	1.0	0.5	13.6	0.50	2.0	1.0	15.5	1.05	1.8	1.9									
INLET AT A7/A10	A7/A1											-1.9									
BASIN A6	A6	A6	0.7	0.5	13.6	0.35	2.0	0.7													
ROUTE TO A5	A5																				
COMBINE BASIN A5	A5	A5	1.0	0.5	16.6	0.50	1.8	0.9	16.6	0.85	1.8	1.5									
INLET AT A5	A5											-1.5									
BASIN A2	A2	A2	4.8	1.0	25.9	4.56	1.4	6.6													
INLET AT A2	A2							-6.6													
BASIN A1	A1	A1	0.3	1.0	13.1	0.29	2.0	0.6													
INLET AT A1	A1							-0.6													

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

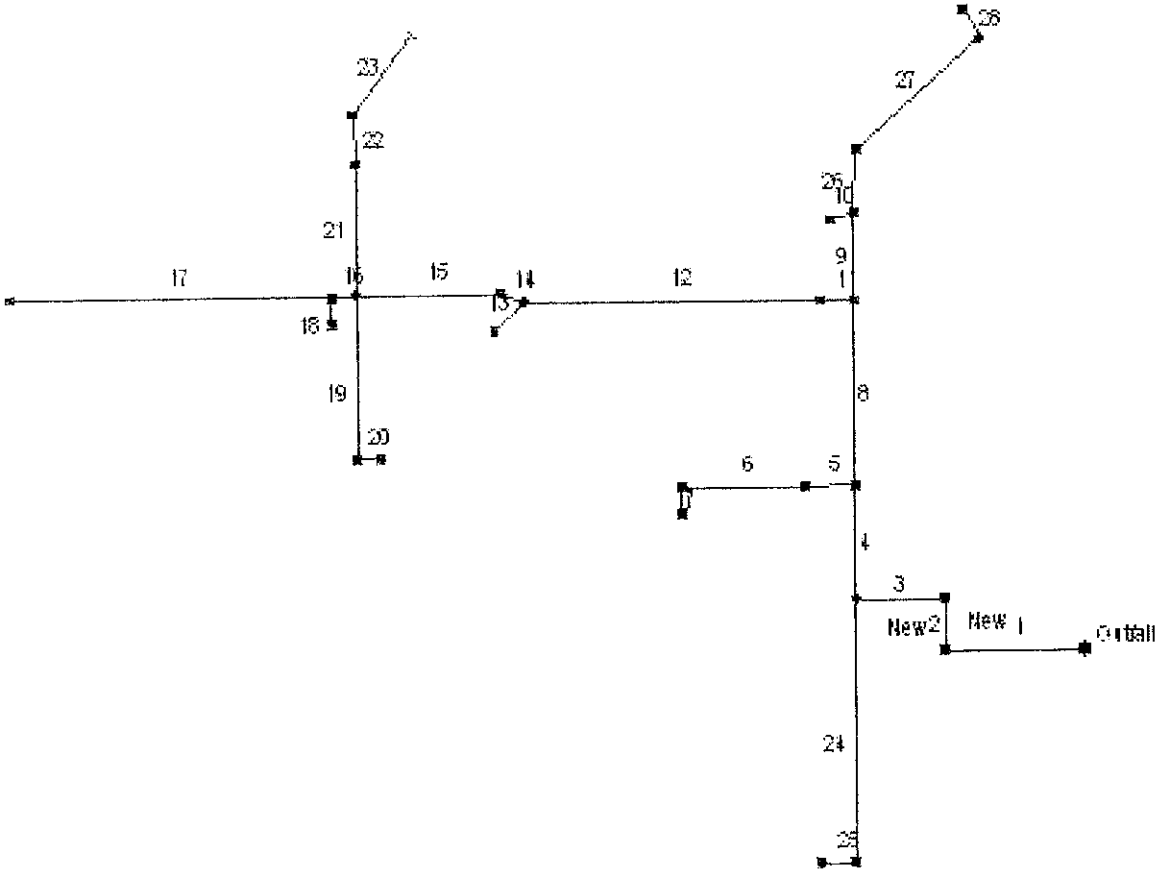
CALCULATED BY: RCY
DATE: 6/7/2006
CHECKED BY: _____

PROJECT: The Pointe
JN: 3824
DESIGN STORM: 10-Year

Negative flow indicates flow into storm sewer.

STREET	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
	DESIGN POINT	AREA DESIG.	AREA (Ac)	RUNOFF COEFF.	tc (min)	CA (Ac)	I (in/hr)	Q (cfs)	tc (min)	CA (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Flow (cfs)	Flow (cfs)	Slope (%)	Size (in)	Length (ft)	Velocity (fps)	tt (min)	
BASIN H6	H6	H6	4.9	0.5	15.0	2.45	1.9	4.6													
BASIN H4	H4	H4	4.9	0.5	20.0	2.45	1.6	4.0													

Hydraflow Plan View



Project File: Preferred Alt.stm	No. Lines: 28	06-20-2006

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	(2)(2)	30.00	30 c	180.0	31.80	32.46	0.367	33.76	34.94	0.87	35.82	End
2	(2)(2)(2)	29.40	30 c	61.5	32.34	32.46	0.195	35.84*	36.16*	0.84	36.99	1
3	(2)(2)(2)	27.40	30 c	115.0	32.56	33.17	0.530	37.07*	37.58*	0.48	38.06	2
4		20.40	24 c	135.8	33.27	33.95	0.501	38.06*	39.17*	0.98	40.15	3
5		2.60	18 c	64.7	34.05	34.37	0.495	40.78*	40.82*	0.02	40.83	4
6		1.60	18 c	162.7	34.47	35.29	0.504	40.85*	40.89*	0.02	40.91	5
7		1.60	18 c	32.0	35.39	35.60	0.656	40.91*	40.92*	0.01	40.93	6
8		15.80	24 c	219.3	34.05	35.14	0.497	40.42*	41.49*	0.59	42.08	4
9		2.90	18 c	104.9	35.24	35.77	0.505	42.43*	42.51*	0.06	42.57	8
10		1.00	18 c	32.0	35.87	36.03	0.500	42.61*	42.61*	0.00	42.62	9
11		12.90	24 c	43.0	35.24	35.46	0.512	42.21*	42.35*	0.13	42.48	8
12		11.30	24 c	387.0	35.56	37.49	0.499	42.54*	43.51*	0.14	43.65	11
13		0.90	18 c	51.0	37.59	37.84	0.491	43.85*	43.85*	0.00	43.85	12
14		10.40	24 c	30.2	37.59	37.74	0.496	43.68*	43.74*	0.10	43.84	12
15		8.90	24 c	190.4	37.84	38.79	0.499	43.89*	44.18*	0.12	44.31	14
16		4.00	18 c	31.8	38.89	39.05	0.503	44.35*	44.40*	0.12	44.52	15
17		1.80	18 c	420.5	39.15	41.17	0.480	44.58*	44.71*	0.02	44.72	16
18		1.10	18 c	32.0	39.15	39.31	0.500	44.59*	44.60*	0.01	44.60	16
19		1.90	18 c	190.8	38.89	41.12	1.169	44.42*	44.48*	0.03	44.51	15
20		1.00	18 c	32.0	41.22	41.38	0.500	44.52*	44.52*	0.00	44.53	19
21		3.00	18 c	158.5	38.89	39.68	0.499	44.39*	44.52*	0.02	44.54	15
22		2.00	18 c	58.5	39.78	40.07	0.496	44.57*	44.59*	0.02	44.61	21
23		1.00	18 c	120.0	40.17	41.00	0.692	44.62*	44.63*	0.00	44.64	22
24		7.00	24 c	314.4	33.27	35.38	0.671	38.47*	38.77*	0.12	38.89	3
25		7.00	24 c	44.0	35.48	35.70	0.500	38.89*	38.93*	0.08	39.01	24
26		1.90	18 c	75.0	35.87	36.25	0.507	42.59*	42.62*	0.02	42.64	9
27		0.50	18 c	209.0	36.35	37.40	0.502	42.66*	42.66*	0.00	42.66	26
28		0.50	18 c	40.0	37.50	37.70	0.500	42.66*	42.66*	0.00	42.66	27

Project File: Preferred Alt.stm | Number of lines: 28 | Run Date: 06-20-2006

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
	(in)	(cfs)									(ft)											(K)	(ft)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1	30	30.00	31.80	33.76	1.96	4.13	7.27	0.82	34.58	0.583	180	32.46	34.94	2.48	4.90	6.12	0.58	35.53	0.501	0.542	0.976	1.50	0.87
2	30	29.40	32.34	35.84	2.50	4.91	5.99	0.56	36.40	0.514	61.5	32.46	36.16	2.50	4.91	5.99	0.56	36.71	0.514	0.514	0.316	1.50	0.84
3	30	27.40	32.56	37.07	2.50	4.91	5.58	0.48	37.55	0.447	115	33.17	37.58	2.50	4.91	5.58	0.48	38.06	0.446	0.446	0.513	1.00	0.48
4	24	20.40	33.27	38.06	2.00	3.14	6.49	0.66	38.72	0.814	136	33.95	39.17	2.00	3.14	6.49	0.66	39.83	0.814	0.814	1.105	1.50	0.98
5	18	2.60	34.05	40.78	1.50	1.77	1.47	0.03	40.81	0.061	64.7	34.37	40.82	1.50	1.77	1.47	0.03	40.85	0.061	0.061	0.040	0.50	0.02
6	18	1.60	34.47	40.85	1.50	1.77	0.91	0.01	40.87	0.023	163	35.29	40.89	1.50	1.77	0.91	0.01	40.90	0.023	0.023	0.038	1.50	0.02
7	18	1.60	35.39	40.91	1.50	1.77	0.91	0.01	40.92	0.023	32.0	35.60	40.92	1.50	1.77	0.91	0.01	40.93	0.023	0.023	0.007	1.00	0.01
8	24	15.80	34.05	40.42	2.00	3.14	5.03	0.39	40.81	0.488	219	35.14	41.49	2.00	3.14	5.03	0.39	41.88	0.488	0.488	1.071	1.50	0.59
9	18	2.90	35.24	42.43	1.50	1.77	1.64	0.04	42.47	0.076	105	35.77	42.51	1.50	1.77	1.64	0.04	42.55	0.076	0.076	0.080	1.50	0.06
10	18	1.00	35.87	42.61	1.50	1.77	0.57	0.00	42.61	0.009	32.0	36.03	42.61	1.50	1.77	0.57	0.00	42.62	0.009	0.009	0.003	1.00	0.00
11	24	12.90	35.24	42.21	2.00	3.14	4.11	0.26	42.47	0.325	43.0	35.46	42.35	2.00	3.14	4.11	0.26	42.61	0.325	0.325	0.140	0.50	0.13
12	24	11.30	35.56	42.54	2.00	3.14	3.60	0.20	42.74	0.250	387	37.49	43.51	2.00	3.14	3.60	0.20	43.71	0.250	0.250	0.966	0.71	0.14
13	18	0.90	37.59	43.85	1.50	1.77	0.51	0.00	43.85	0.007	51.0	37.84	43.85	1.50	1.77	0.51	0.00	43.85	0.007	0.007	0.004	1.00	0.00
14	24	10.40	37.59	43.68	2.00	3.14	3.31	0.17	43.85	0.212	30.2	37.74	43.74	2.00	3.14	3.31	0.17	43.91	0.211	0.211	0.064	0.59	0.10
15	24	8.90	37.84	43.89	2.00	3.14	2.83	0.12	44.01	0.155	190	38.79	44.18	2.00	3.14	2.83	0.12	44.31	0.155	0.155	0.295	1.00	0.12
16	18	4.00	38.89	44.35	1.50	1.77	2.26	0.08	44.43	0.145	31.8	39.05	44.40	1.50	1.77	2.26	0.08	44.48	0.145	0.145	0.046	1.50	0.12
17	18	1.80	39.15	44.58	1.50	1.77	1.02	0.02	44.60	0.029	421	41.17	44.71	1.50	1.77	1.02	0.02	44.72	0.029	0.029	0.124	1.00	0.02
18	18	1.10	39.15	44.59	1.50	1.77	0.62	0.01	44.60	0.011	32.0	39.31	44.60	1.50	1.77	0.62	0.01	44.60	0.011	0.011	0.004	1.00	0.01
19	18	1.90	38.89	44.42	1.50	1.77	1.08	0.02	44.43	0.033	191	41.12	44.48	1.50	1.77	1.08	0.02	44.50	0.033	0.033	0.062	1.50	0.03
20	18	1.00	41.22	44.52	1.50	1.77	0.57	0.00	44.52	0.009	32.0	41.38	44.52	1.50	1.77	0.57	0.00	44.53	0.009	0.009	0.003	1.00	0.00
21	18	3.00	38.89	44.39	1.50	1.77	1.70	0.04	44.43	0.082	158	39.68	44.52	1.50	1.77	1.70	0.04	44.56	0.082	0.082	0.129	0.50	0.02

Project File: Preferred Alt.stm | Number of lines: 28 | Run Date: 06-20-2006

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
	(in)	(cfs)									(ft)											(K)	(ft)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
22	18	2.00	39.78	44.57	1.50	1.77	1.13	0.02	44.59	0.036	58.5	40.07	44.59	1.50	1.77	1.13	0.02	44.61	0.036	0.036	0.021	1.07	0.02
23	18	1.00	40.17	44.62	1.50	1.77	0.57	0.00	44.63	0.009	120	41.00	44.63	1.50	1.77	0.57	0.00	44.64	0.009	0.009	0.011	1.00	0.00
24	24	7.00	33.27	38.47	2.00	3.14	2.23	0.08	38.55	0.096	314	35.38	38.77	2.00	3.14	2.23	0.08	38.85	0.096	0.096	0.301	1.50	0.12
25	24	7.00	35.48	38.89	2.00	3.14	2.23	0.08	38.97	0.096	44.0	35.70	38.93	2.00	3.14	2.23	0.08	39.01	0.096	0.096	0.042	1.00	0.08
26	18	1.90	35.87	42.59	1.50	1.77	1.08	0.02	42.61	0.033	75.0	36.25	42.62	1.50	1.77	1.08	0.02	42.64	0.033	0.033	0.025	1.17	0.02
27	18	0.50	36.35	42.66	1.50	1.77	0.28	0.00	42.66	0.002	209	37.40	42.66	1.50	1.77	0.28	0.00	42.66	0.002	0.002	0.005	0.99	0.00
28	18	0.50	37.50	42.66	1.50	1.77	0.28	0.00	42.66	0.002	40.0	37.70	42.66	1.50	1.77	0.28	0.00	42.66	0.002	0.002	0.001	1.00	0.00

Project File: Preferred Alt.stm | Number of lines: 28 | Run Date: 06-20-2006

Hydraflow HGL Computation Procedure

General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

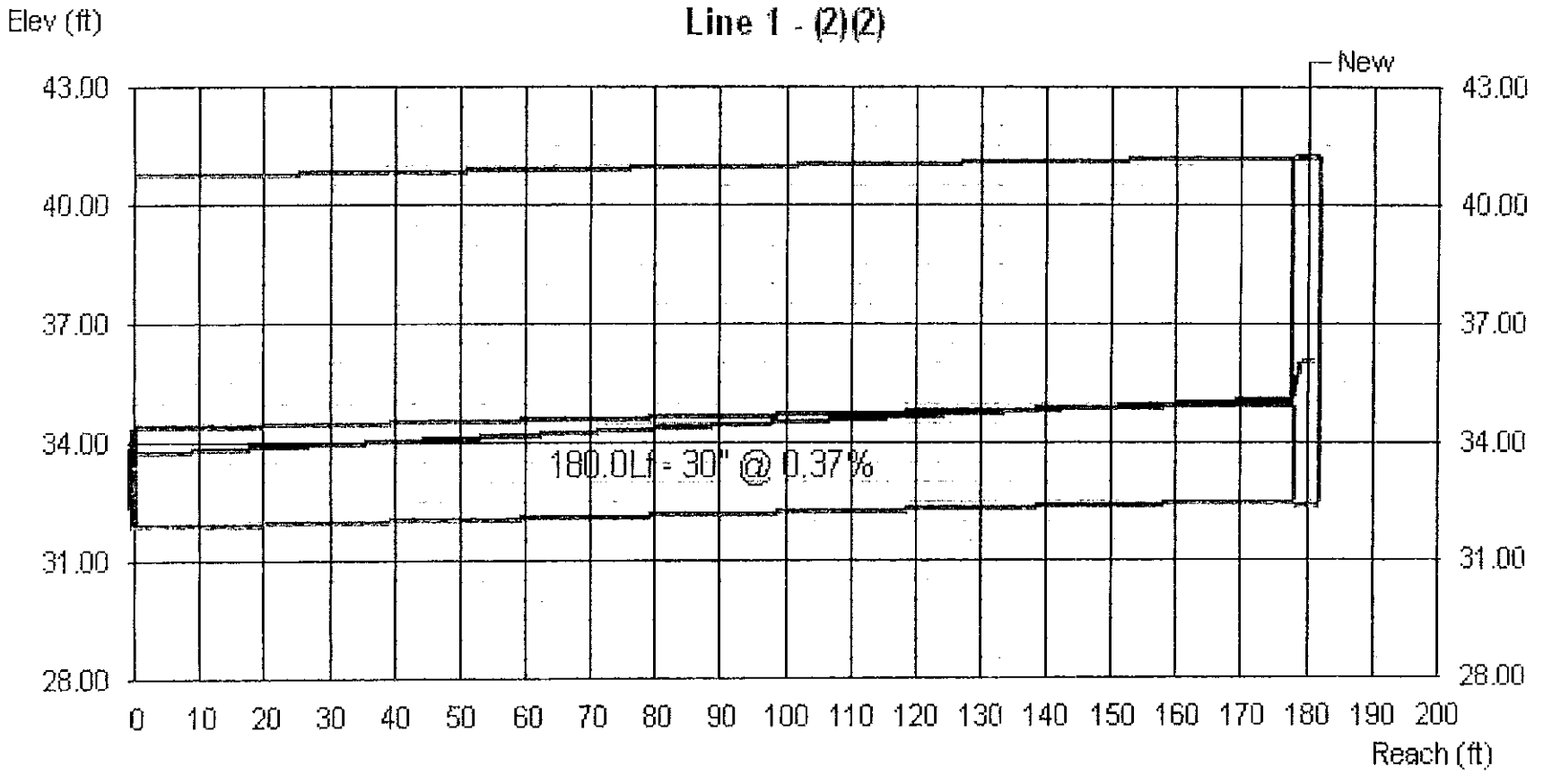
Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Line Profile (Line 1) - (2)(2)



Project File:	No. Lines: 25	06-07-2006

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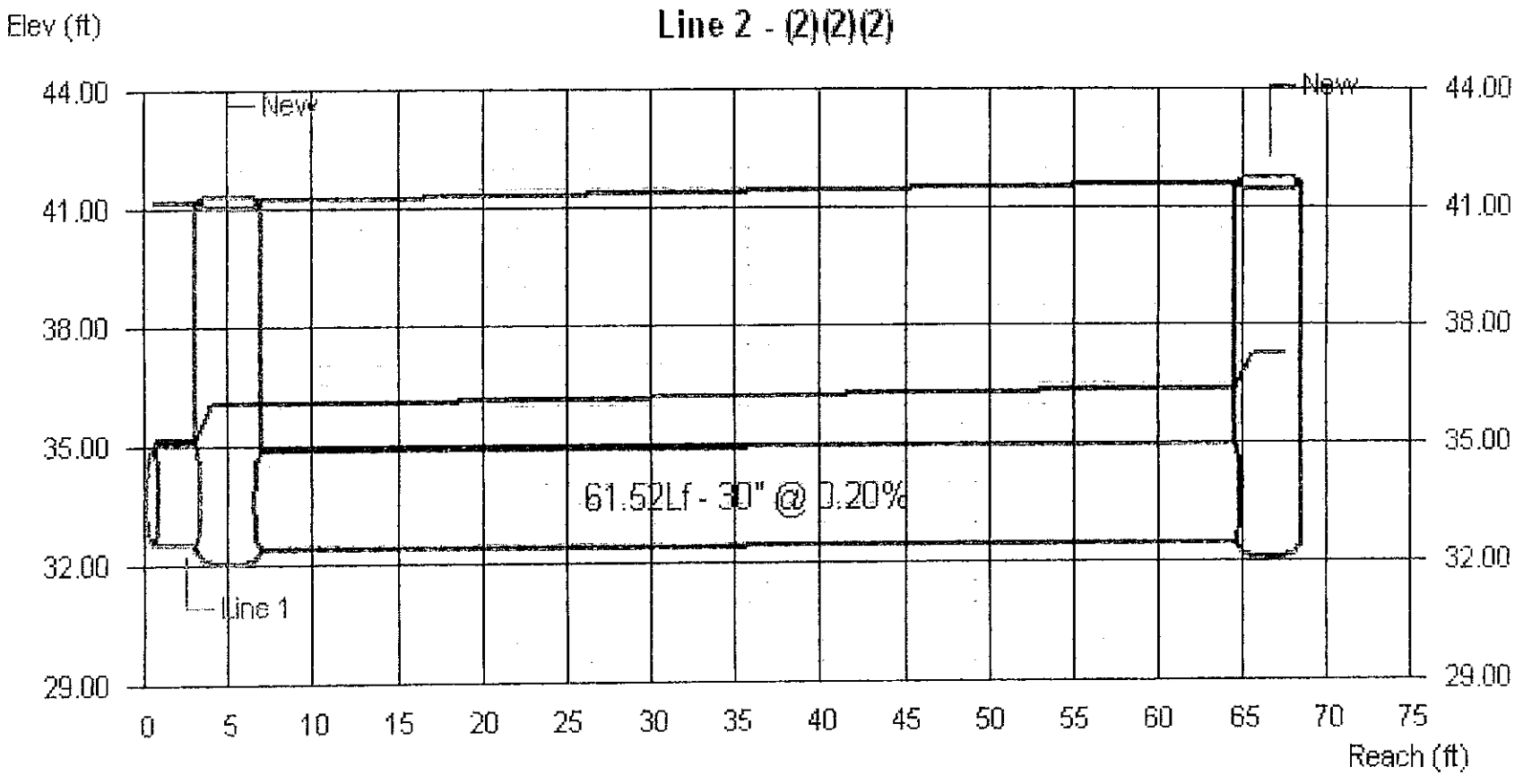

Project File:	No. Lines: 25	06-07-2006

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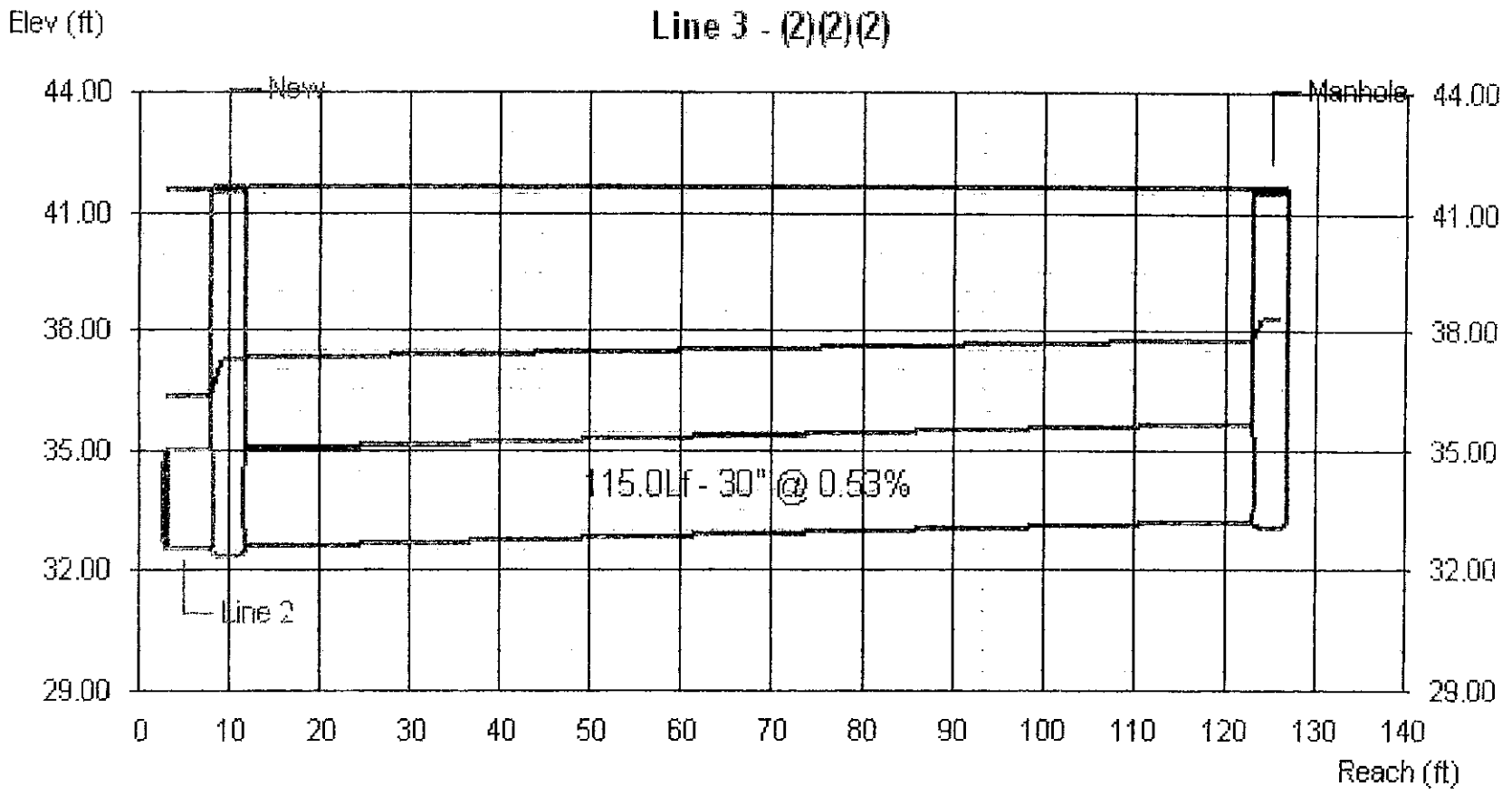

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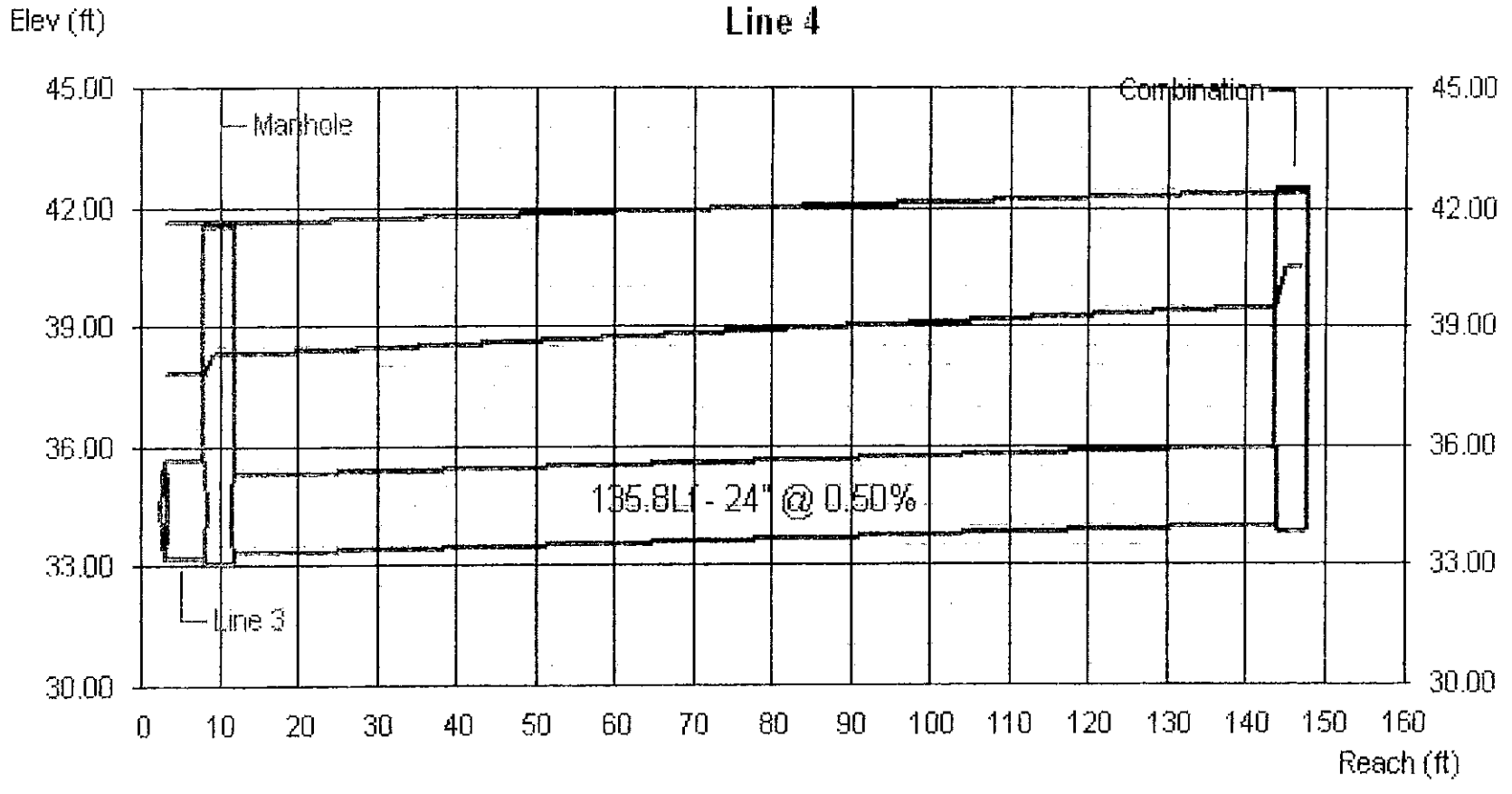

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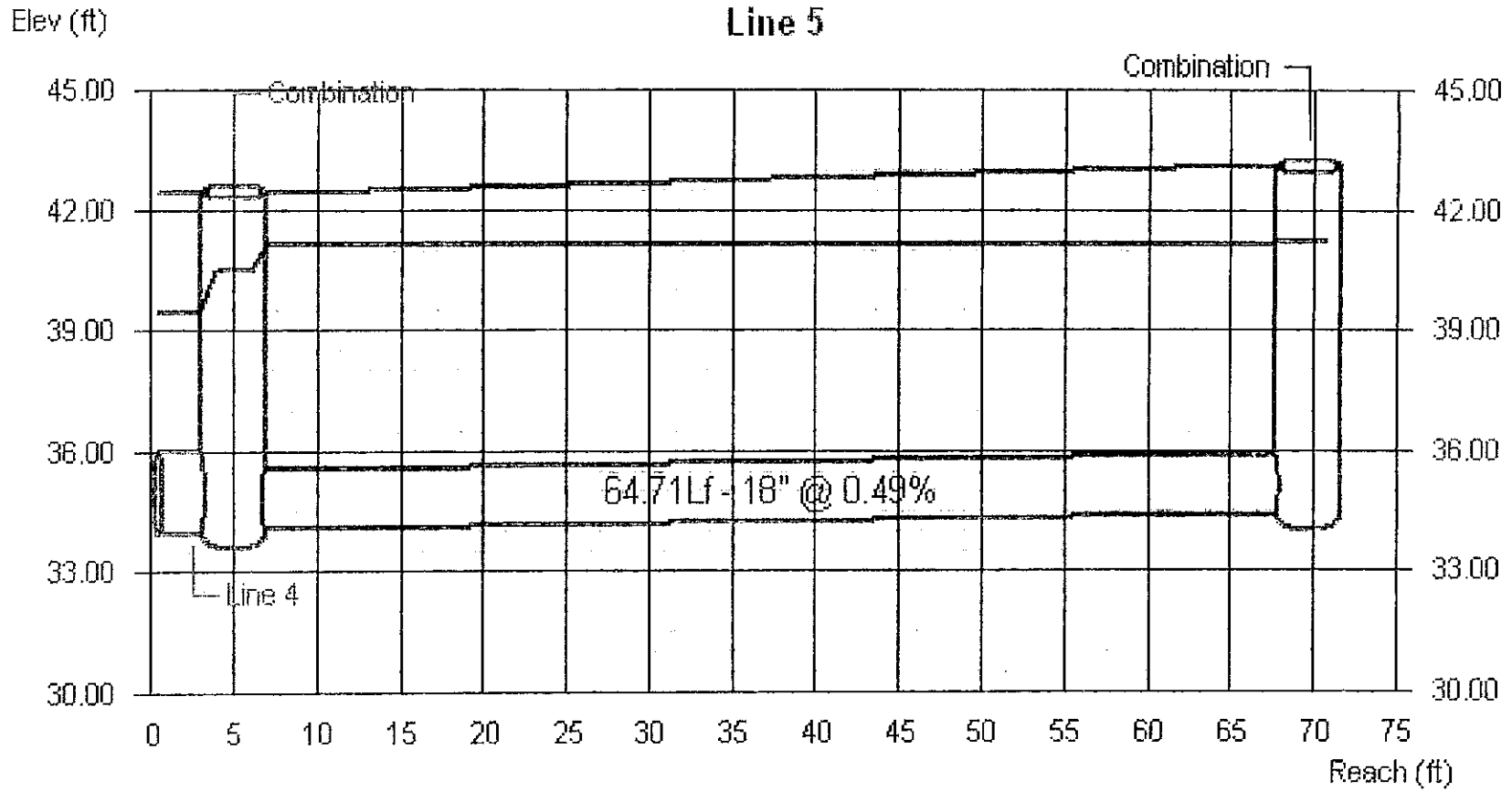

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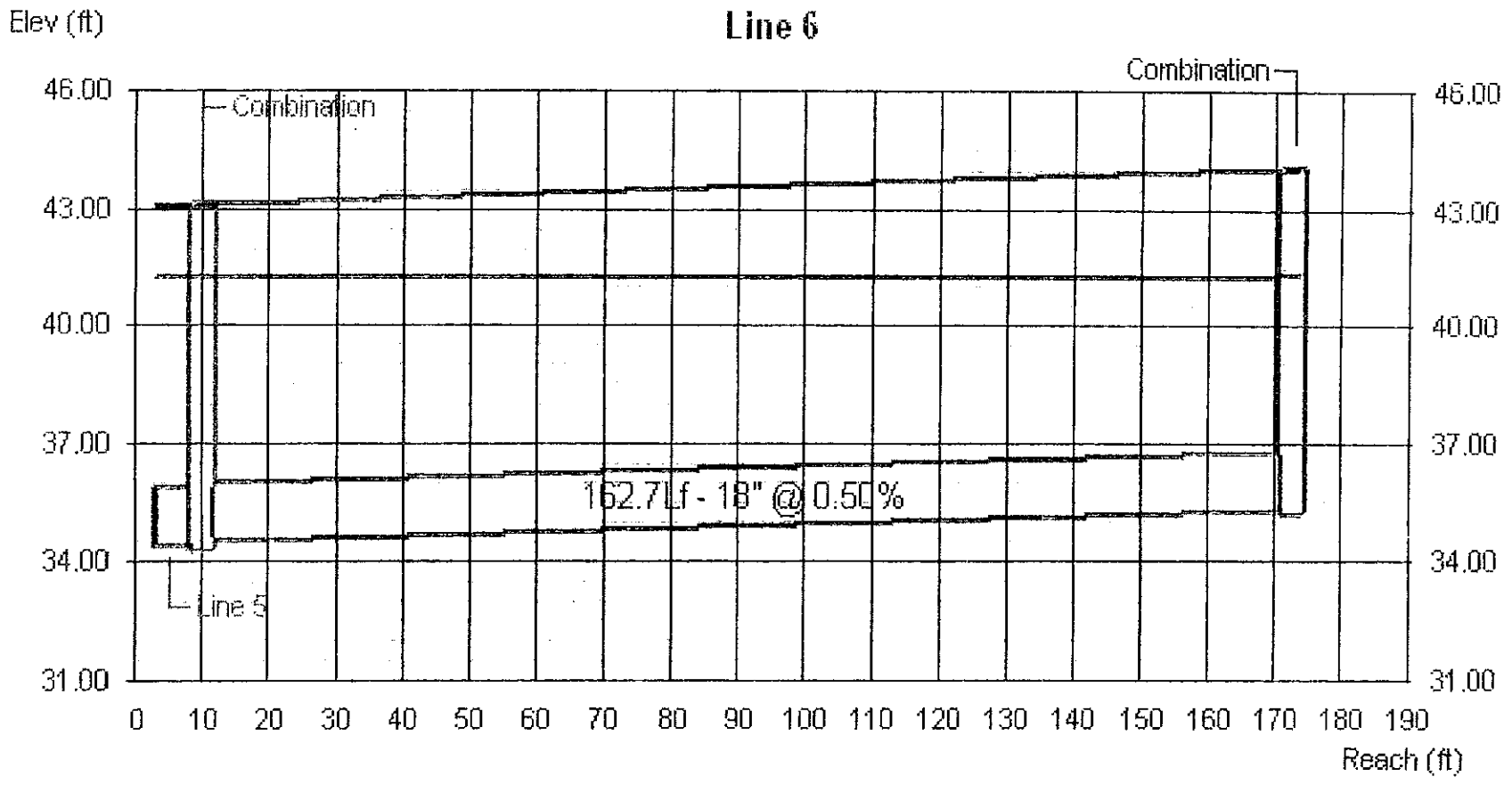

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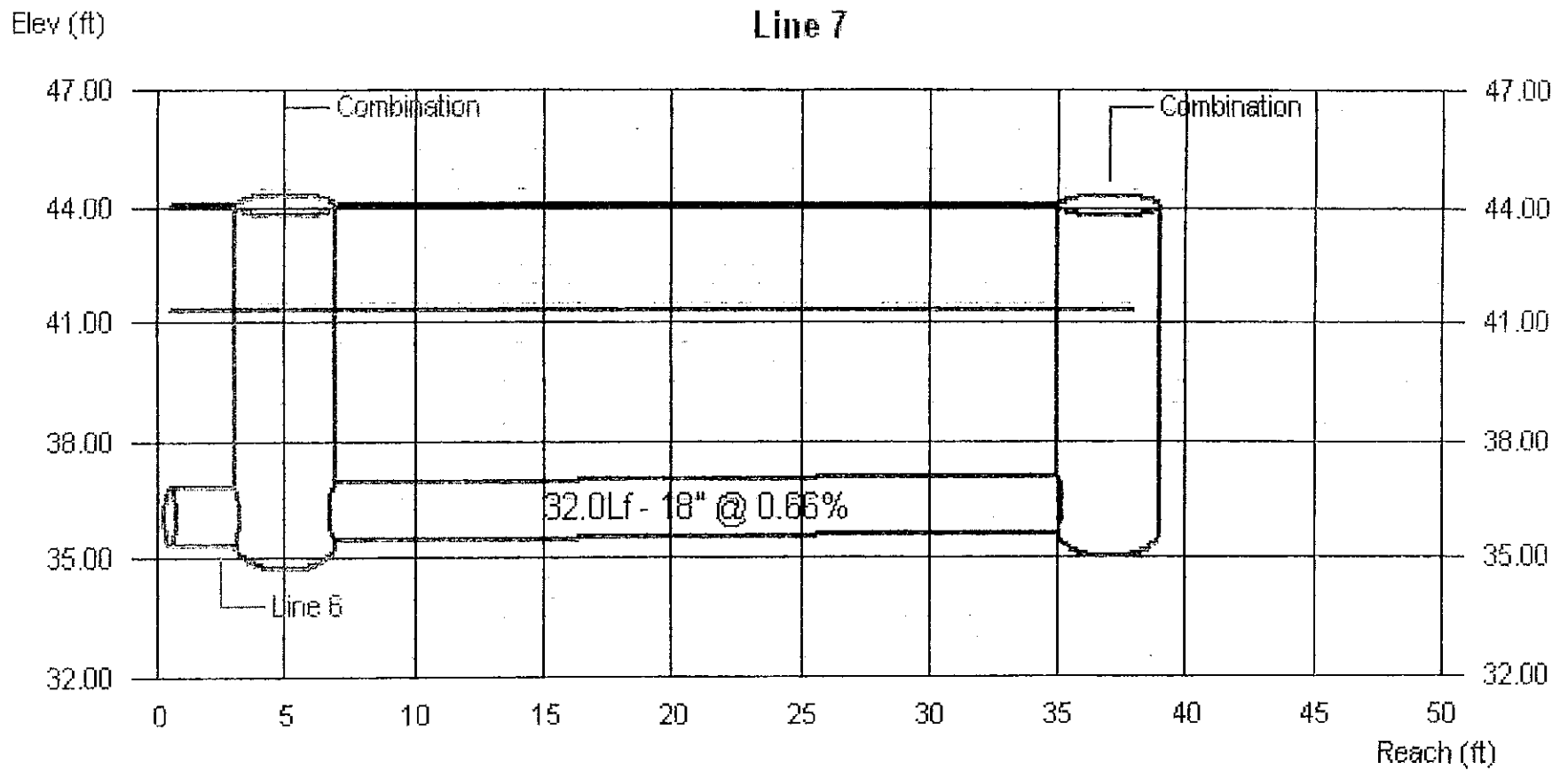

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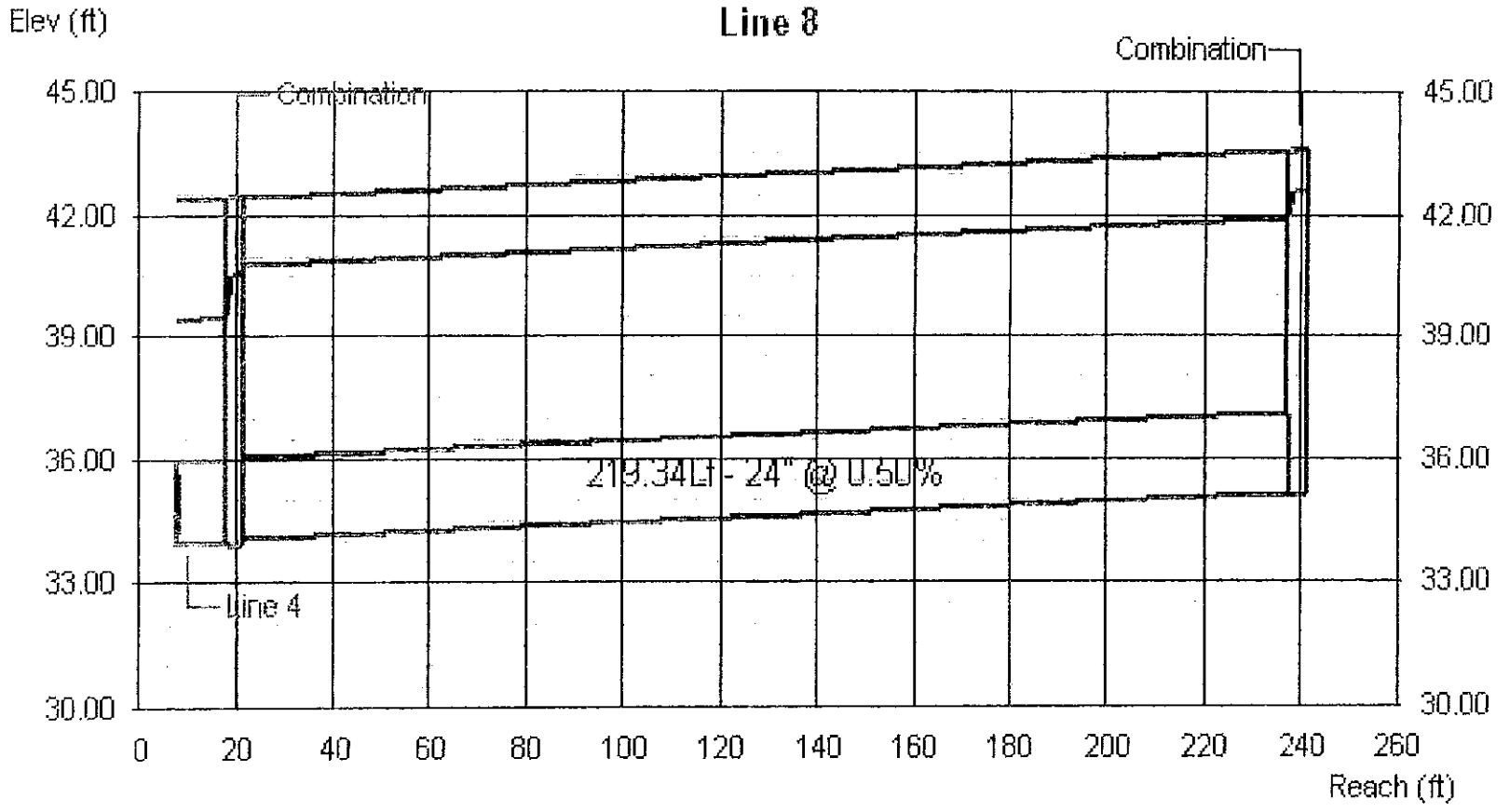

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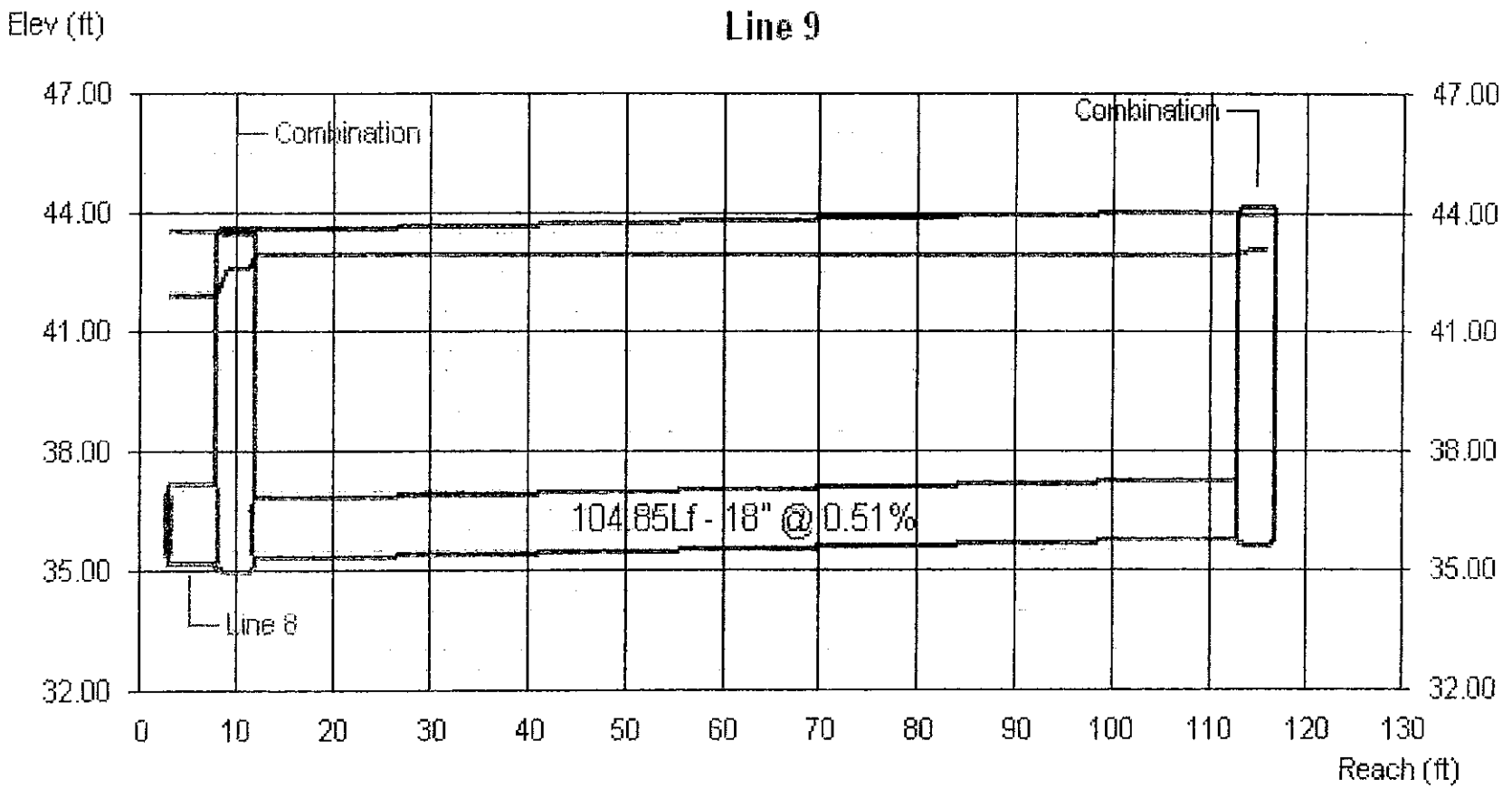

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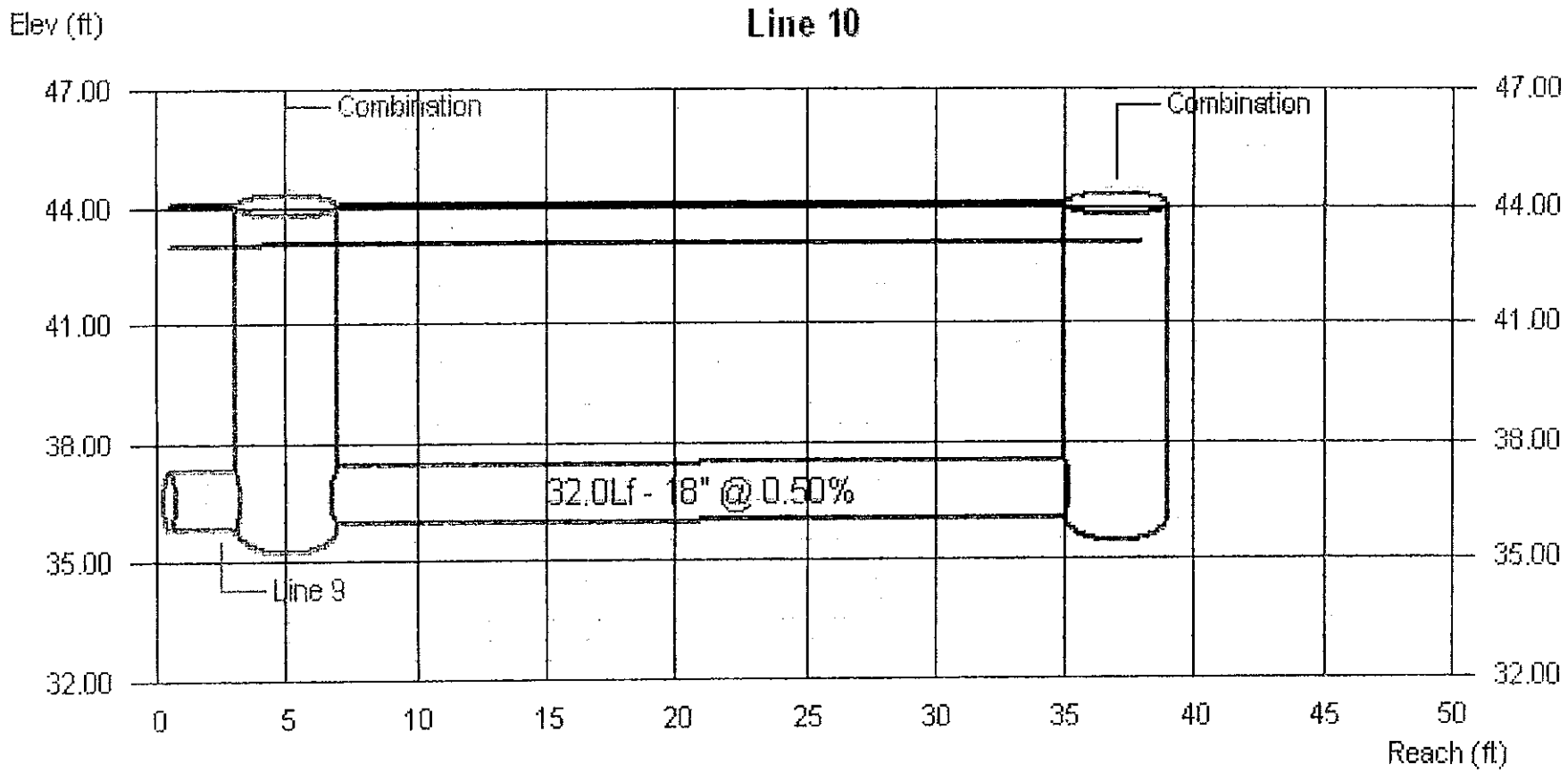

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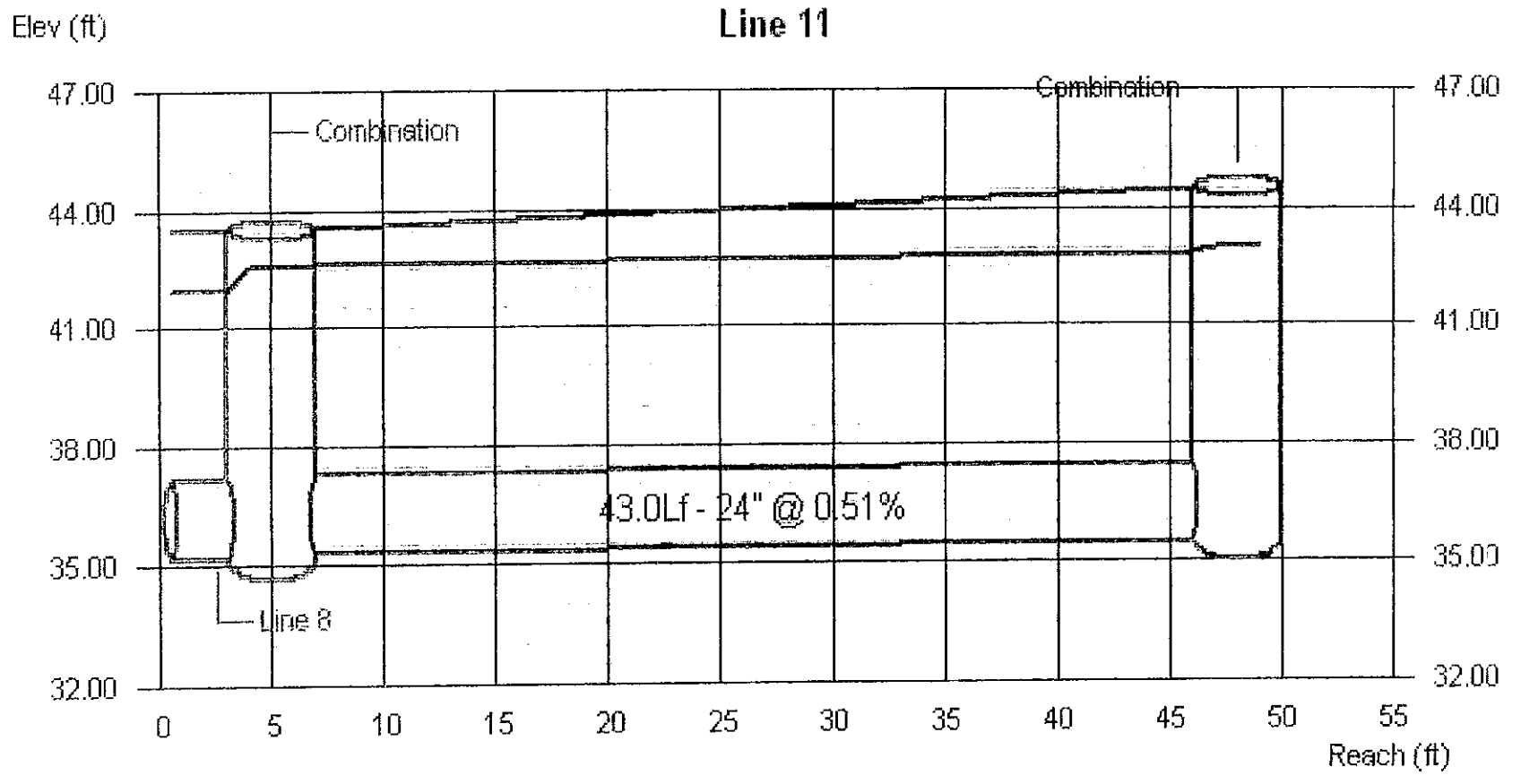

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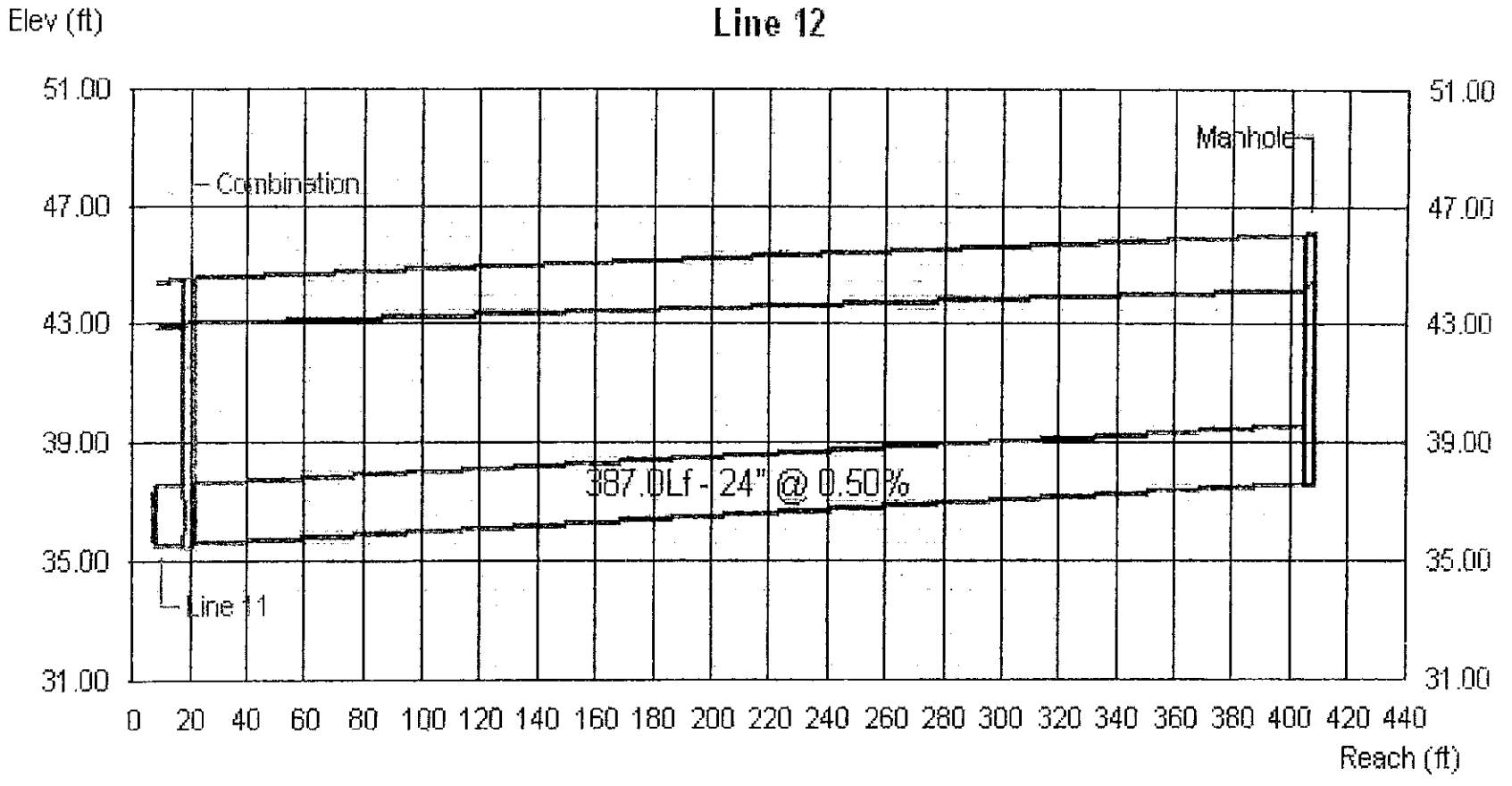

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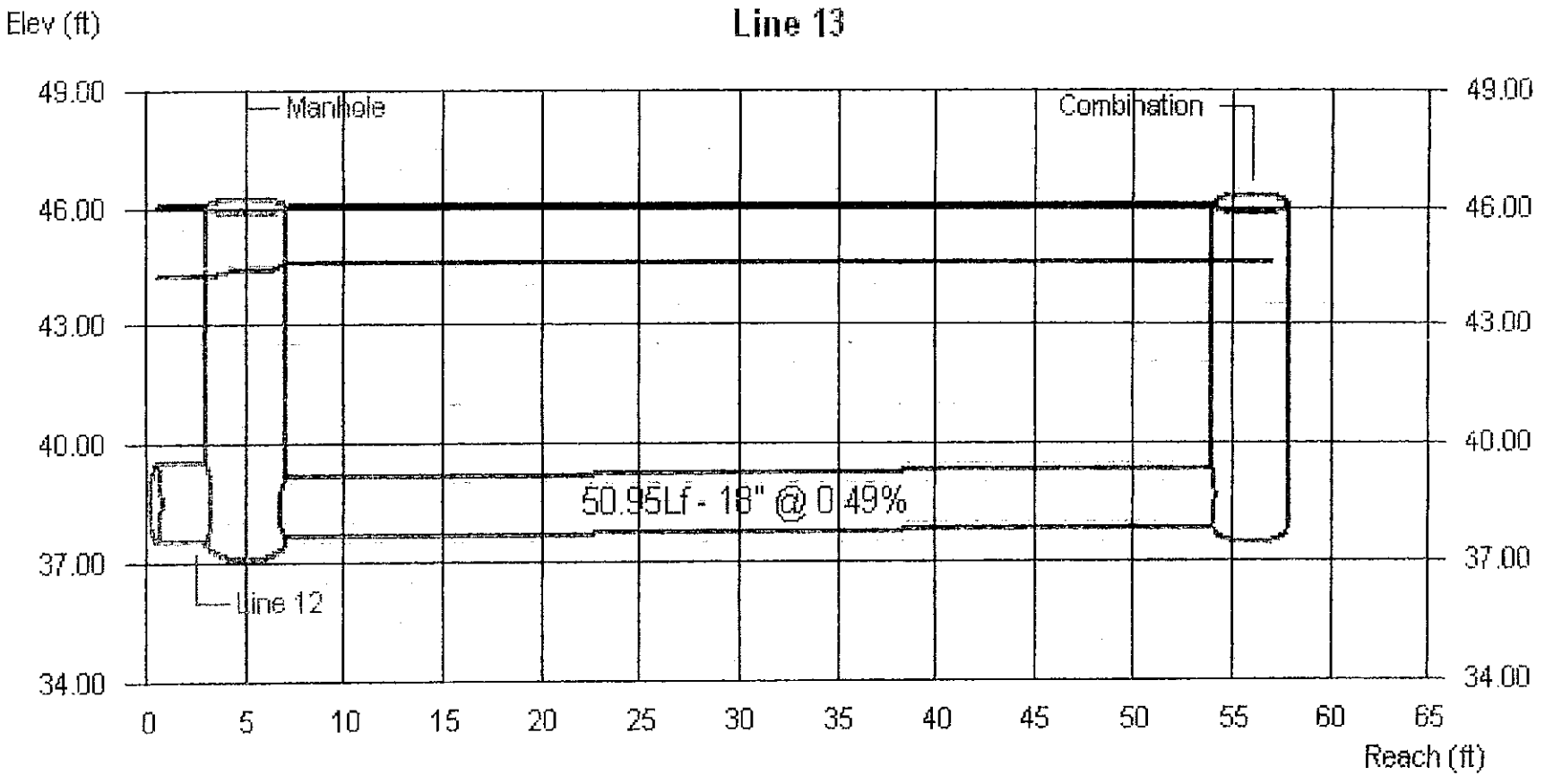

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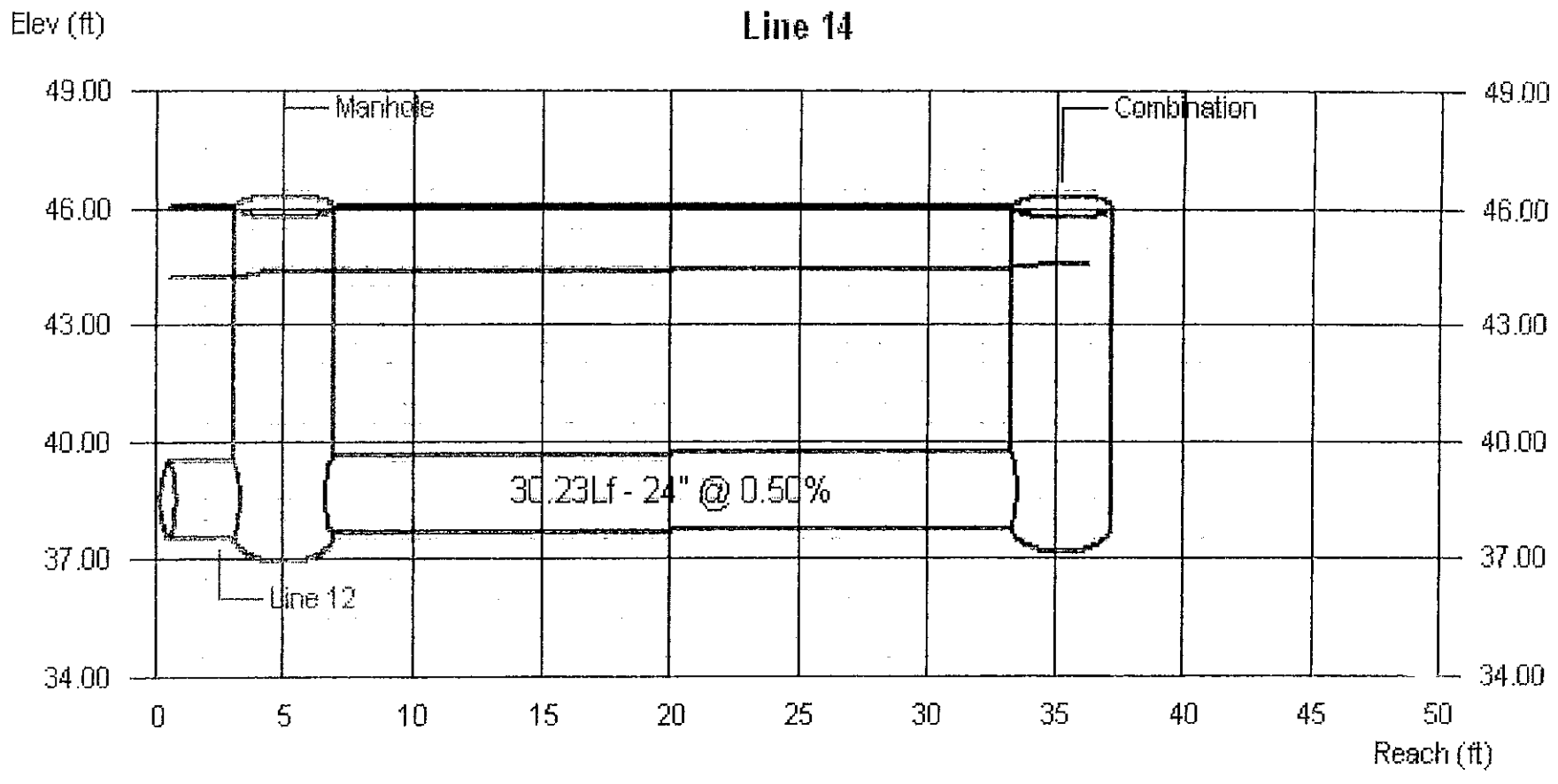

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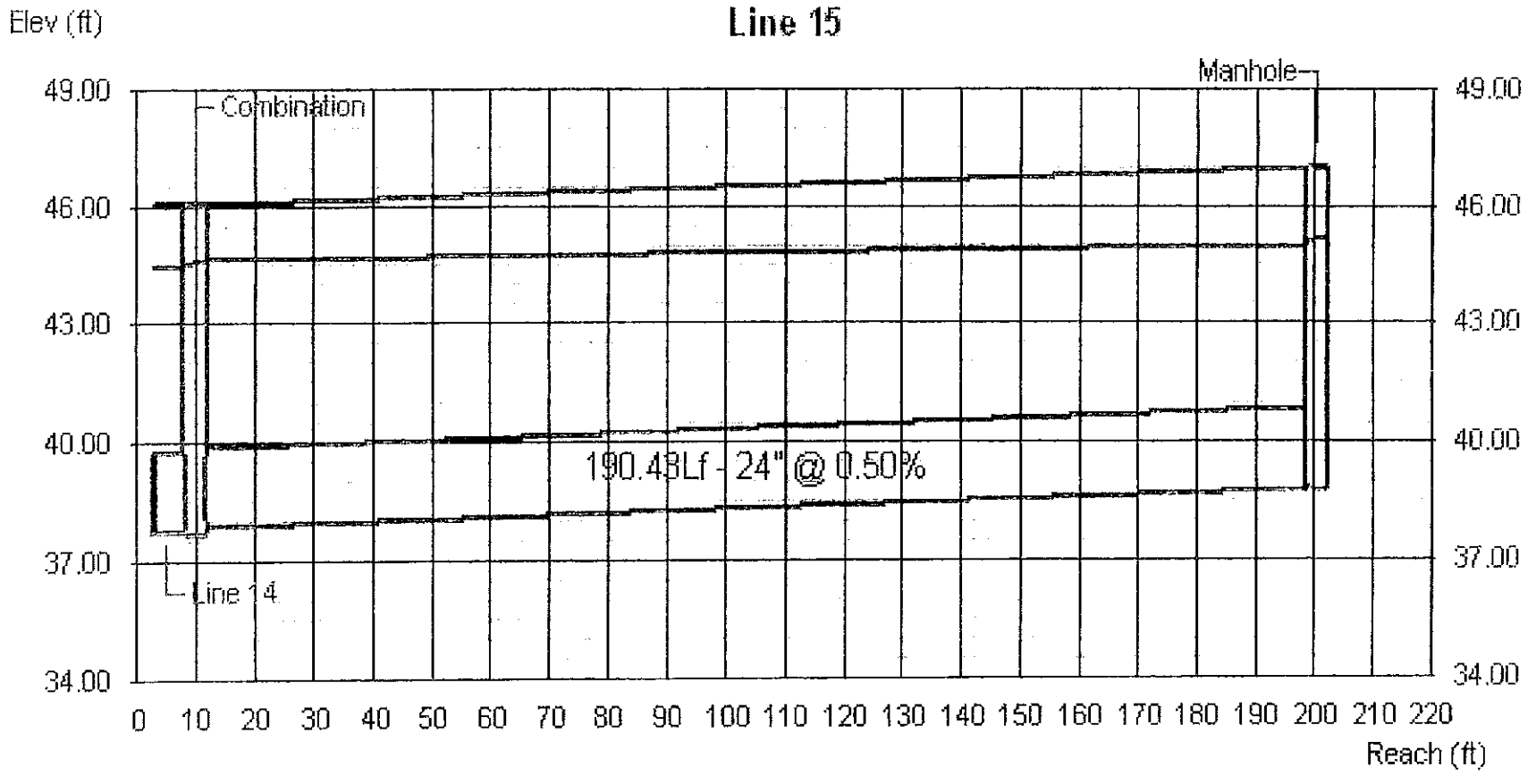

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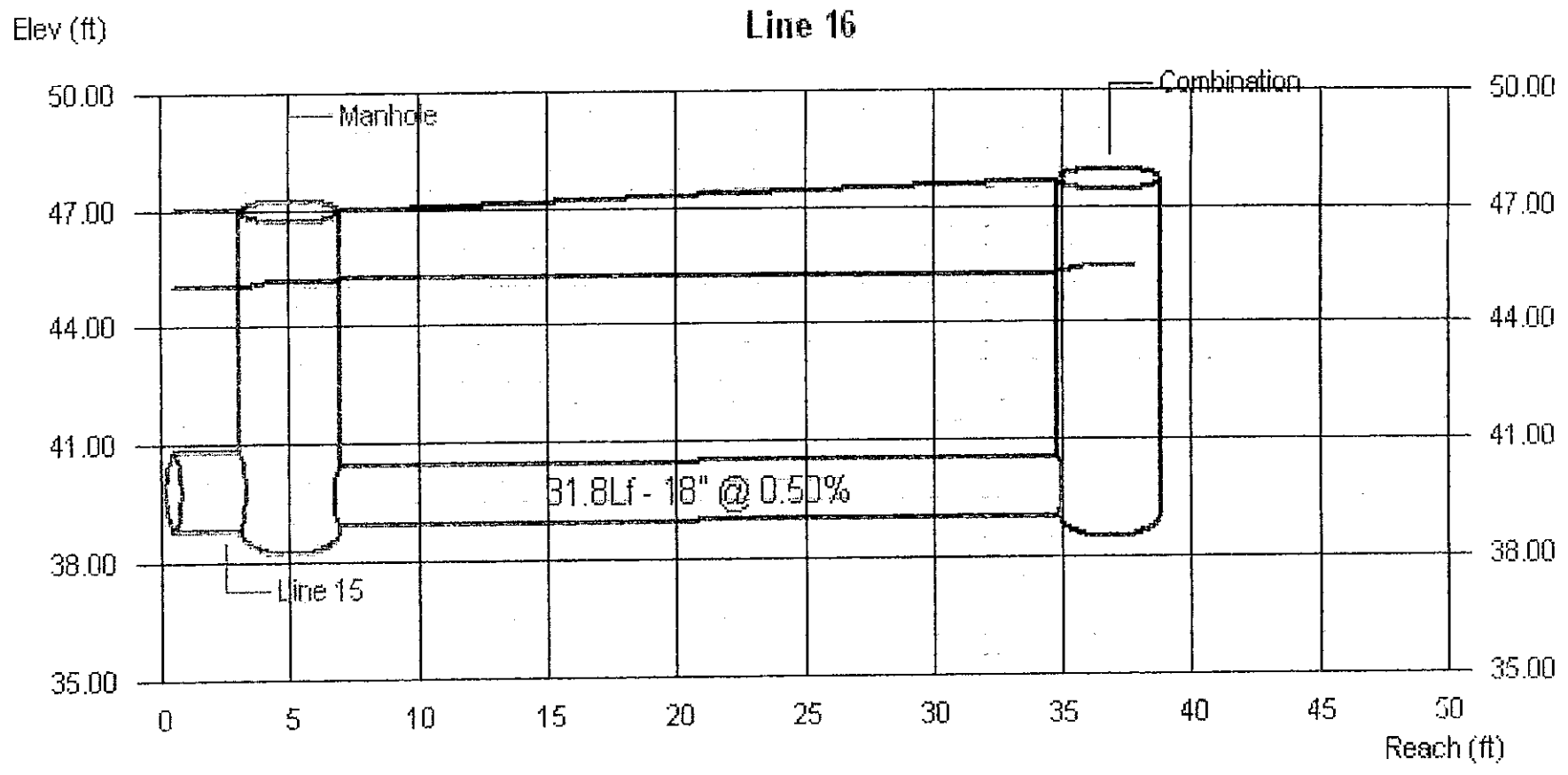

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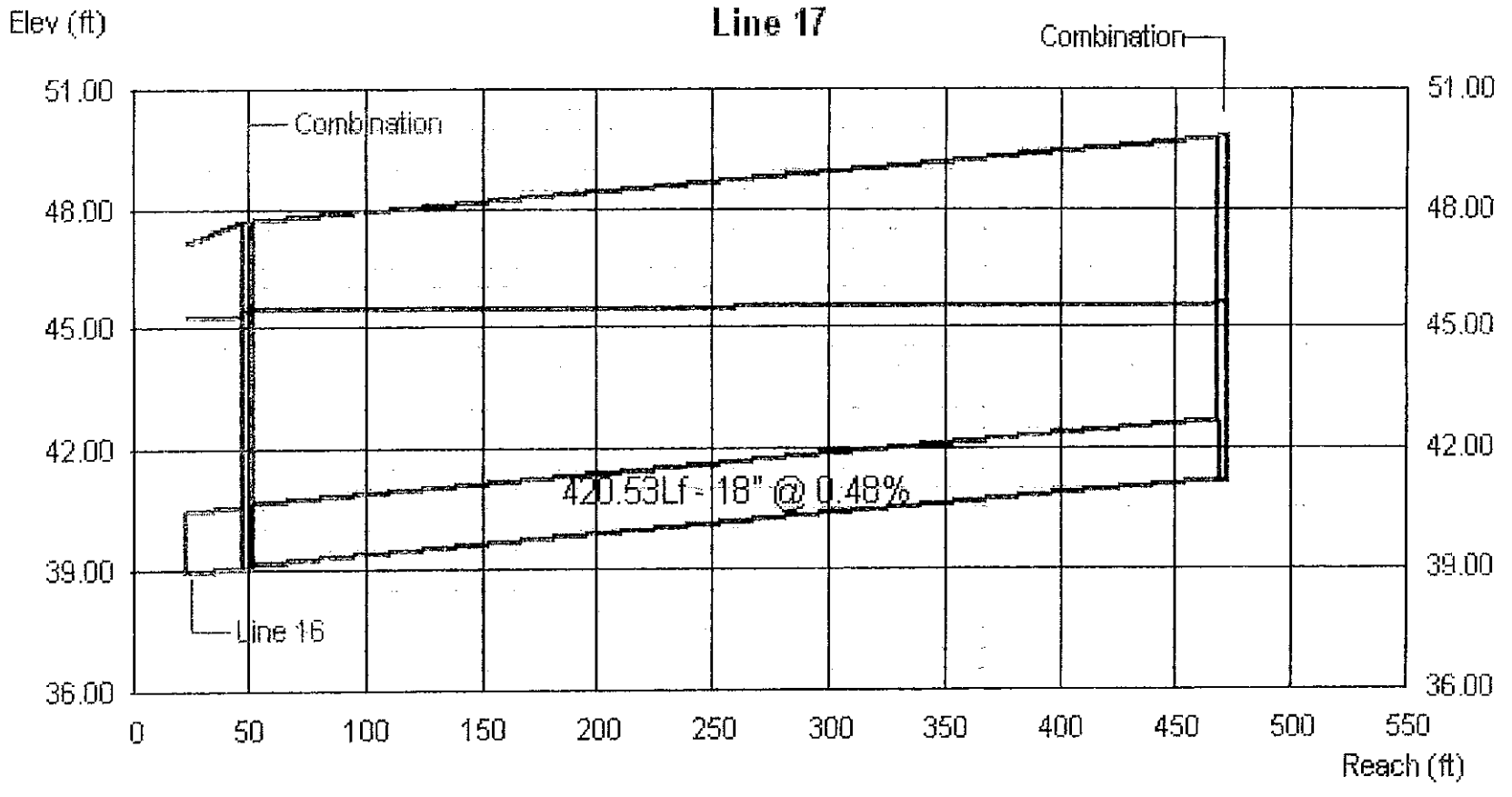

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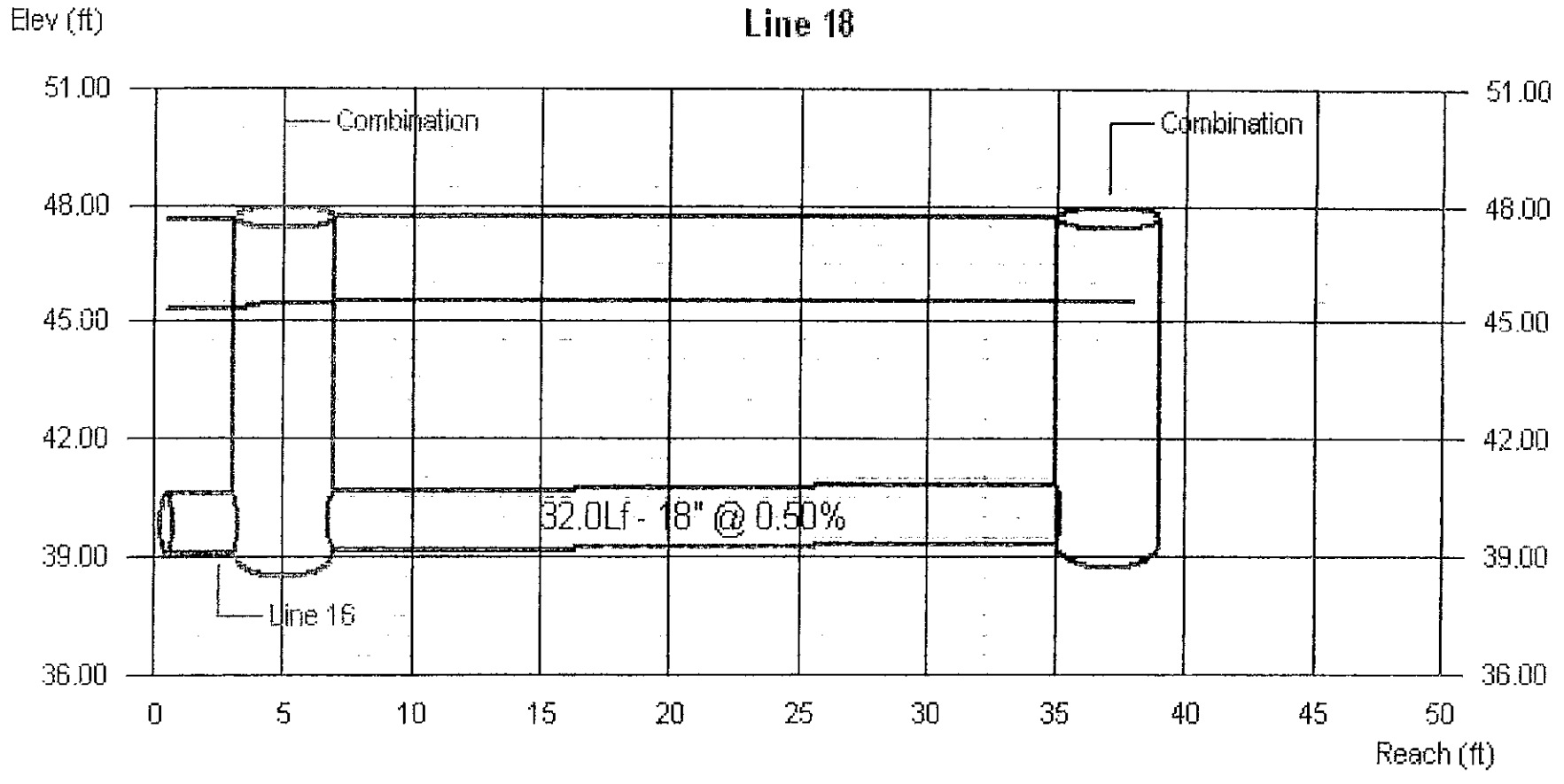

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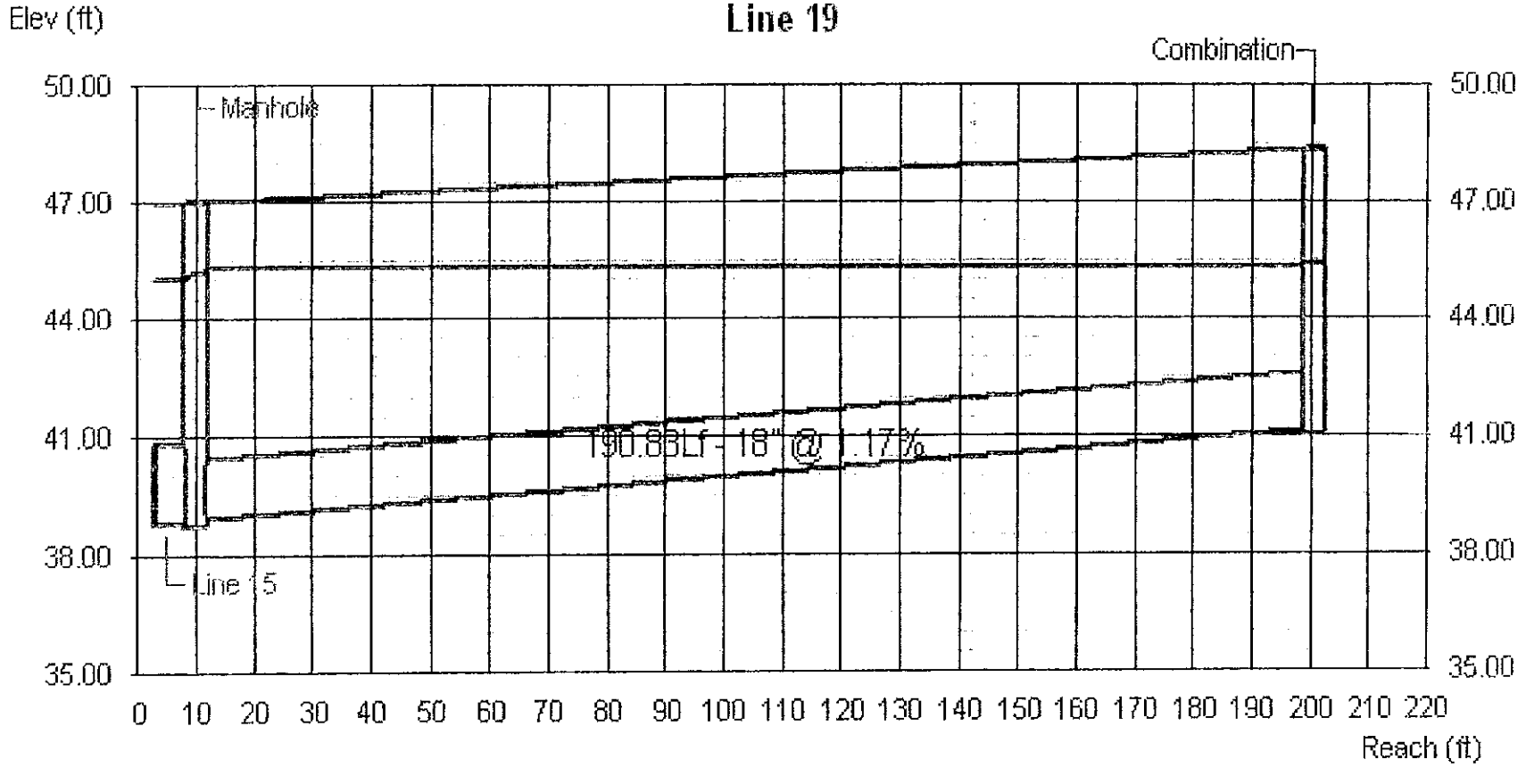

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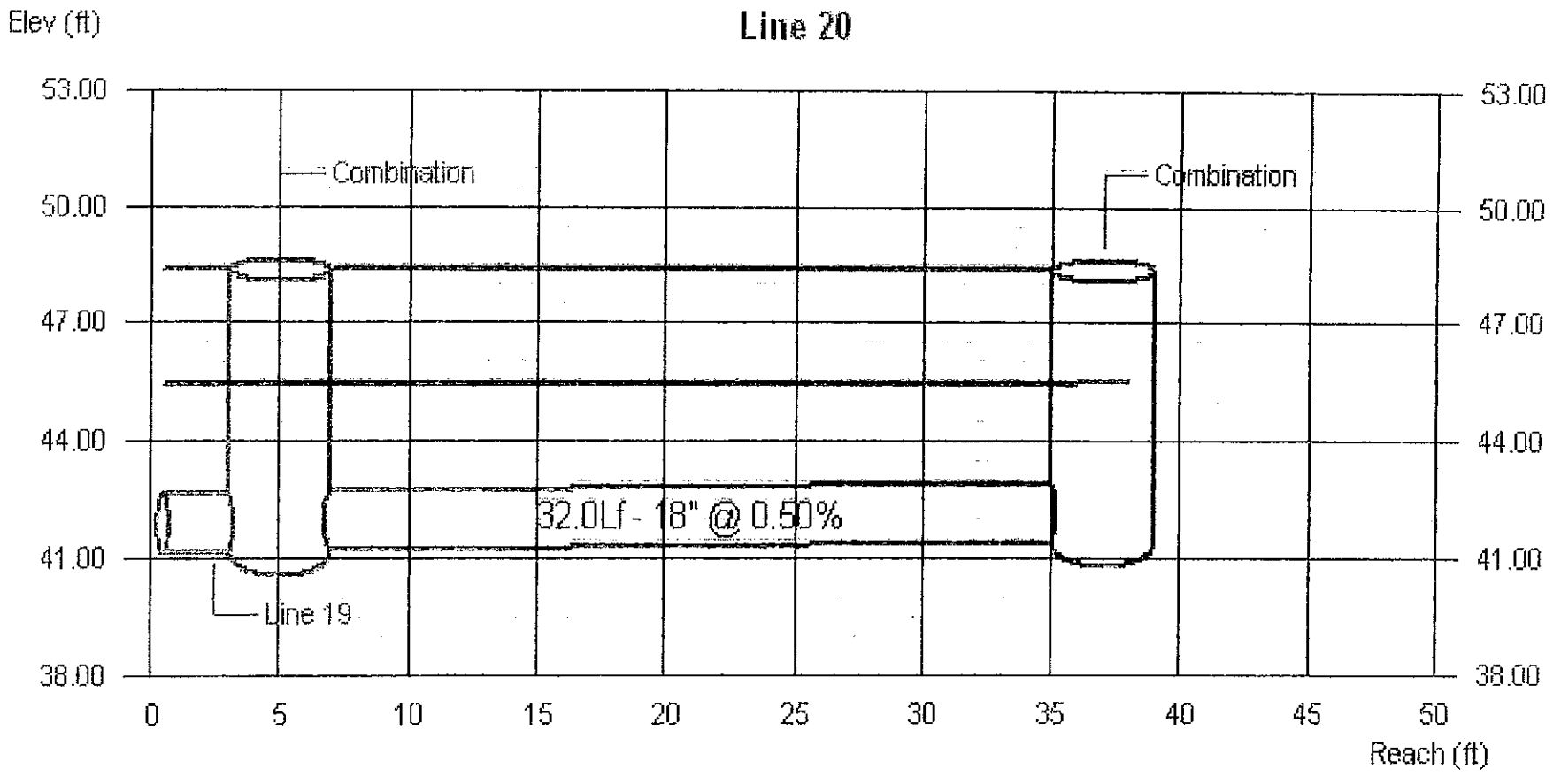

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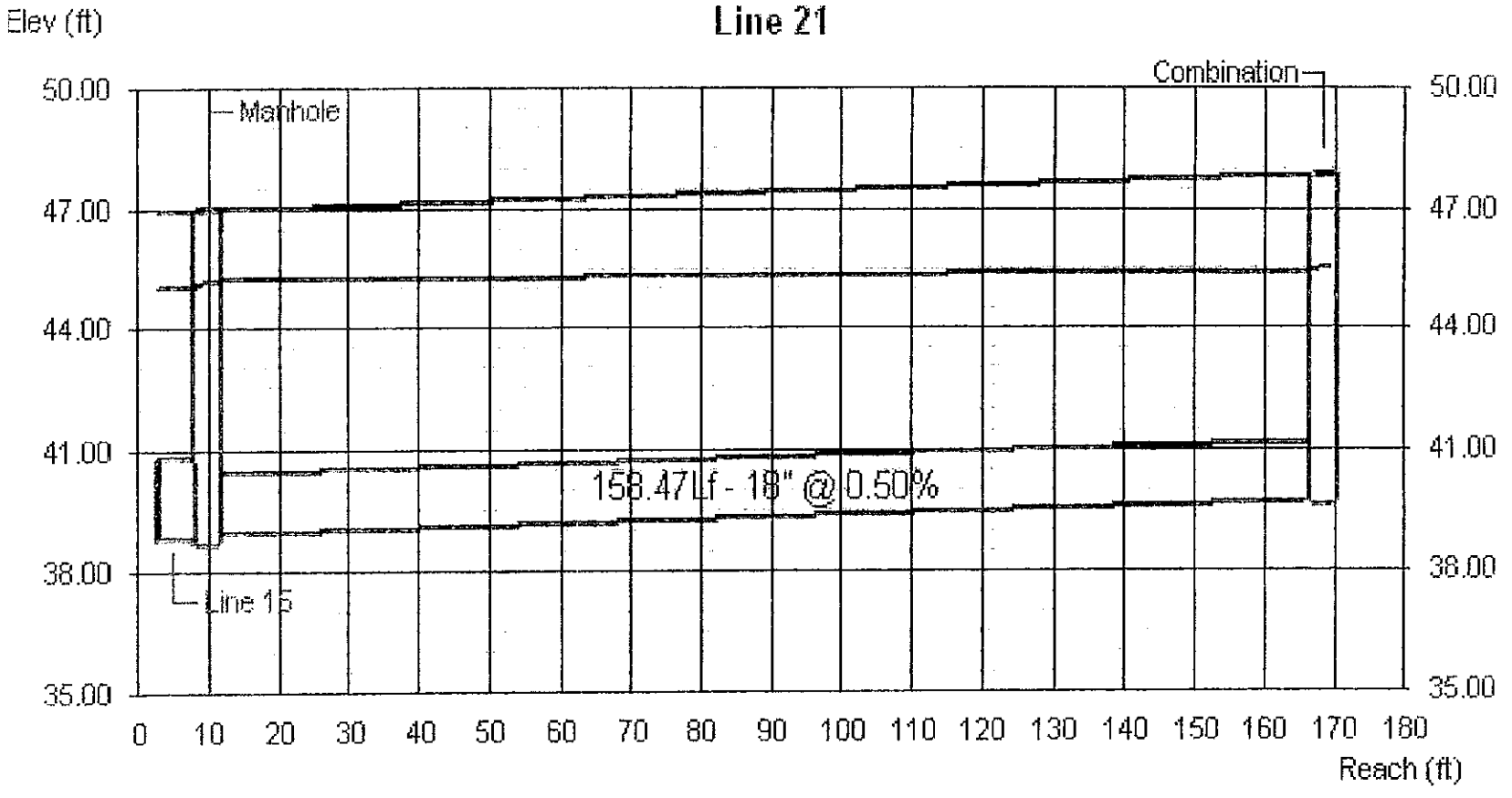

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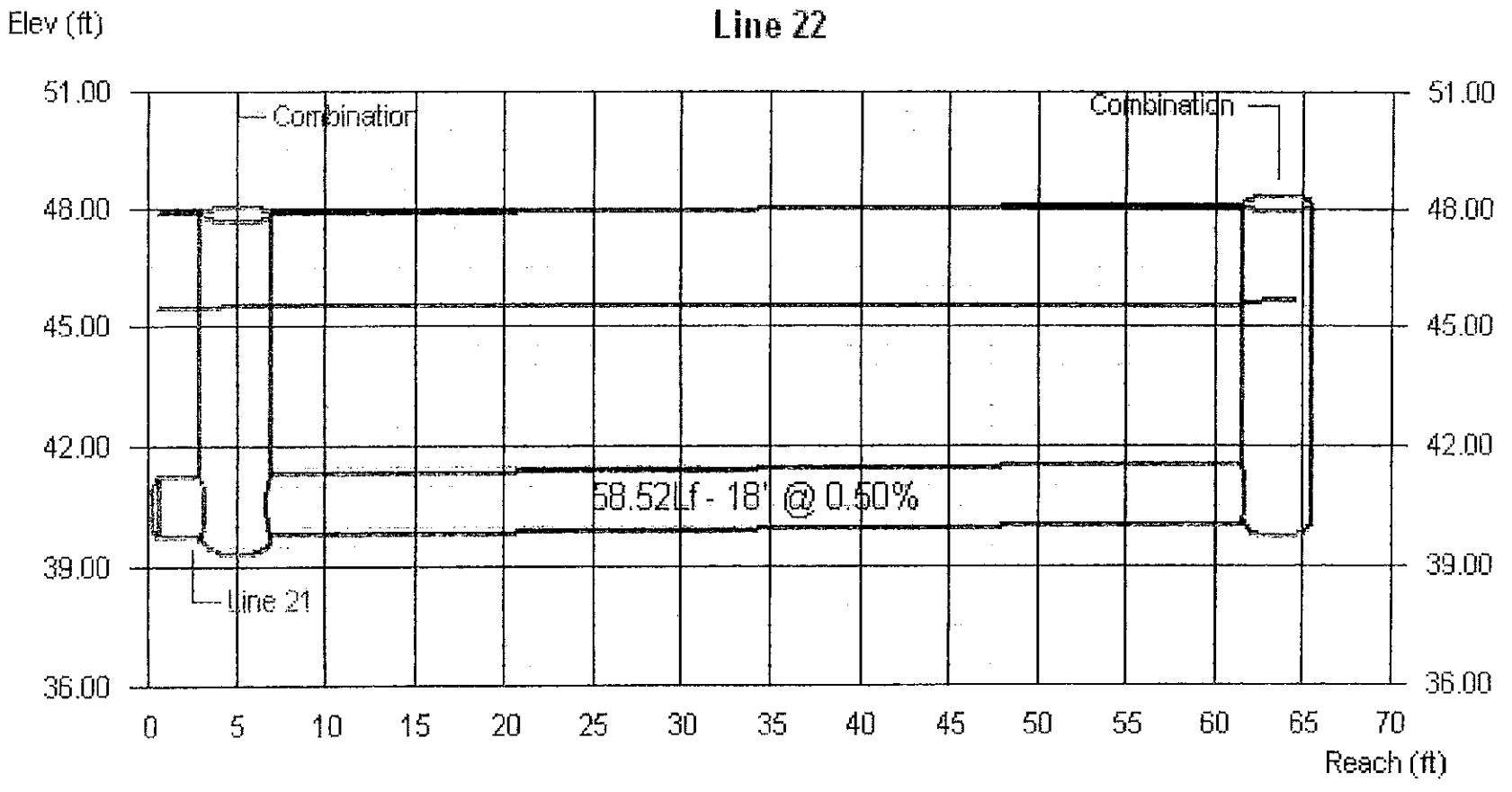

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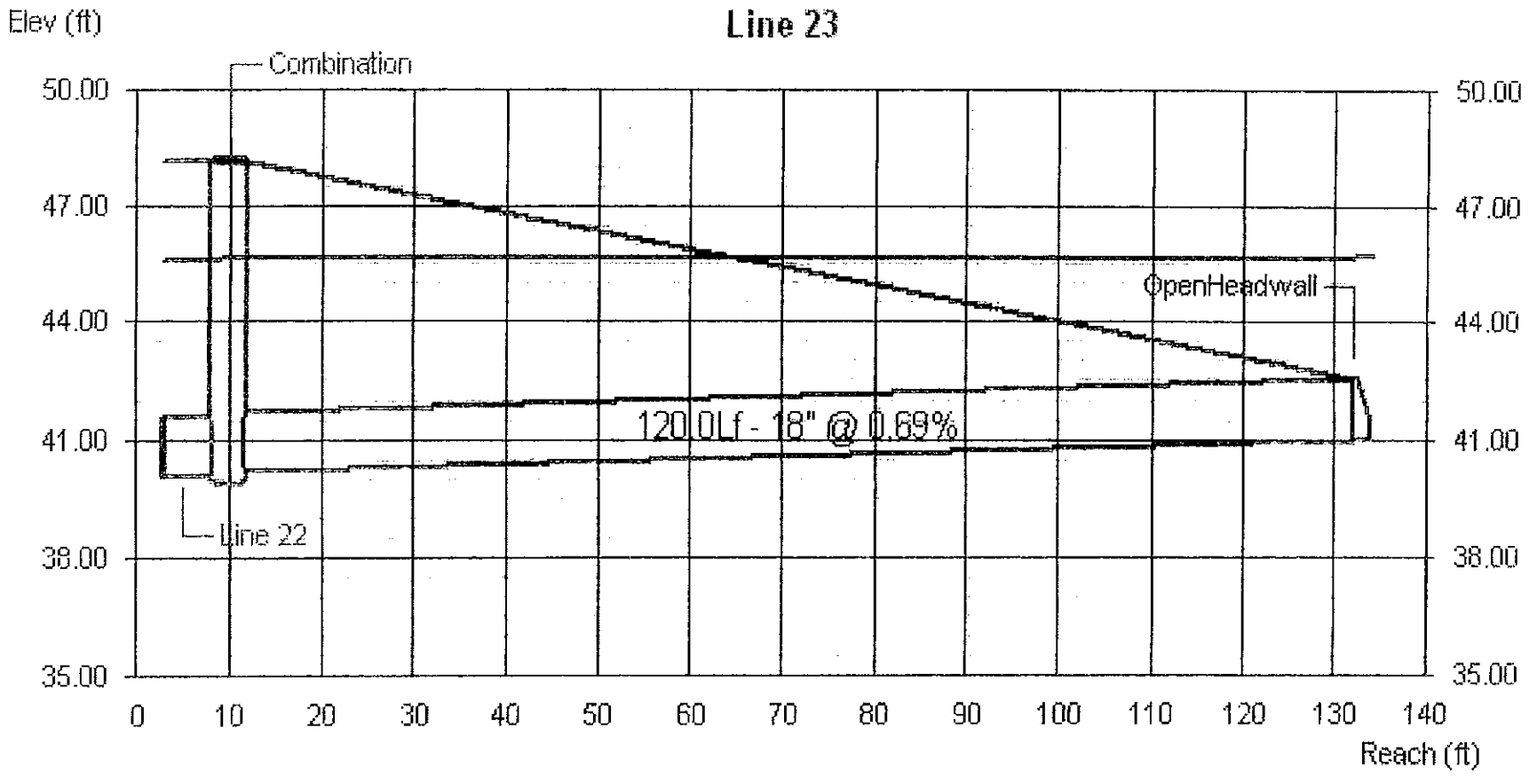

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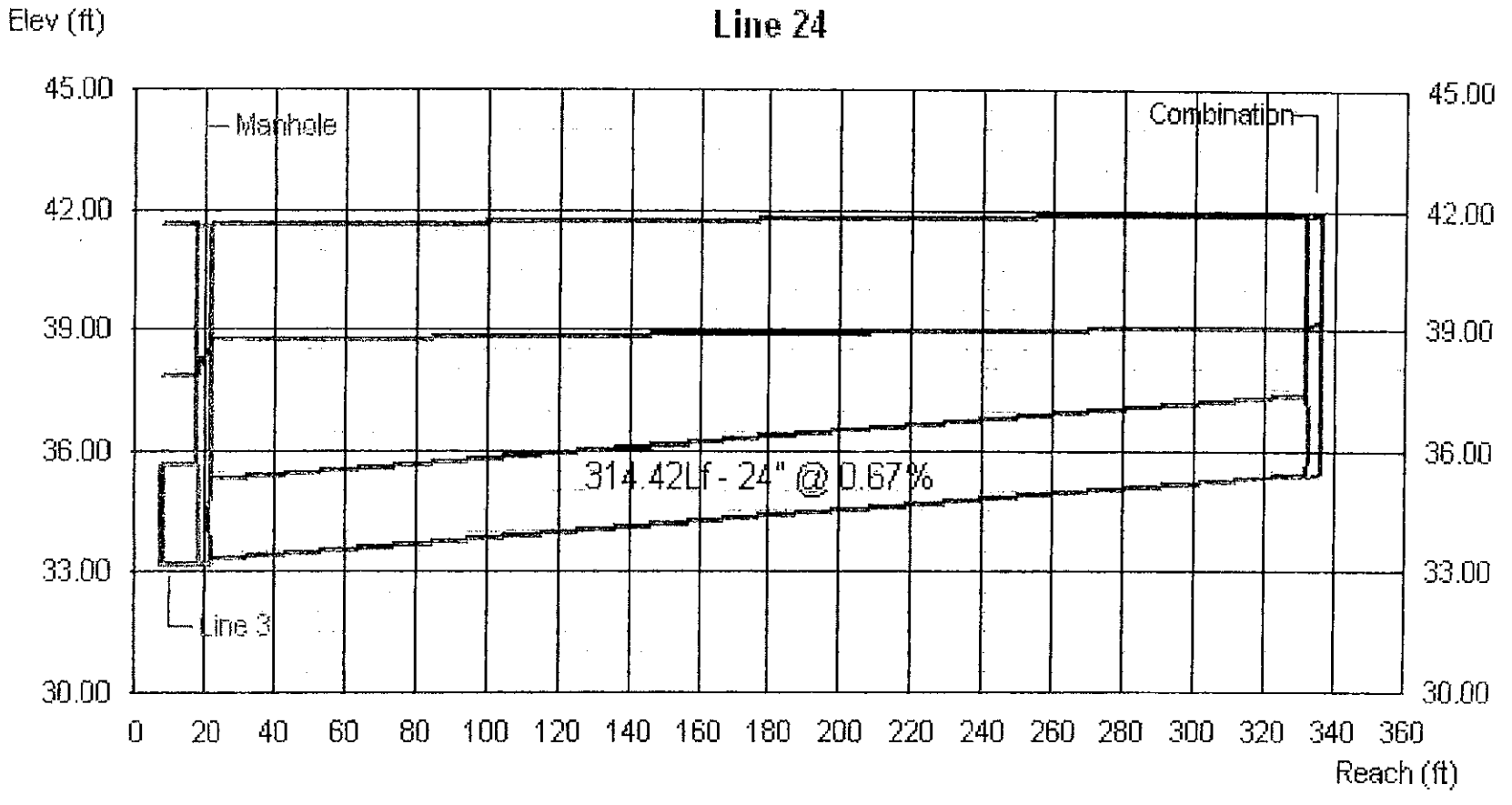

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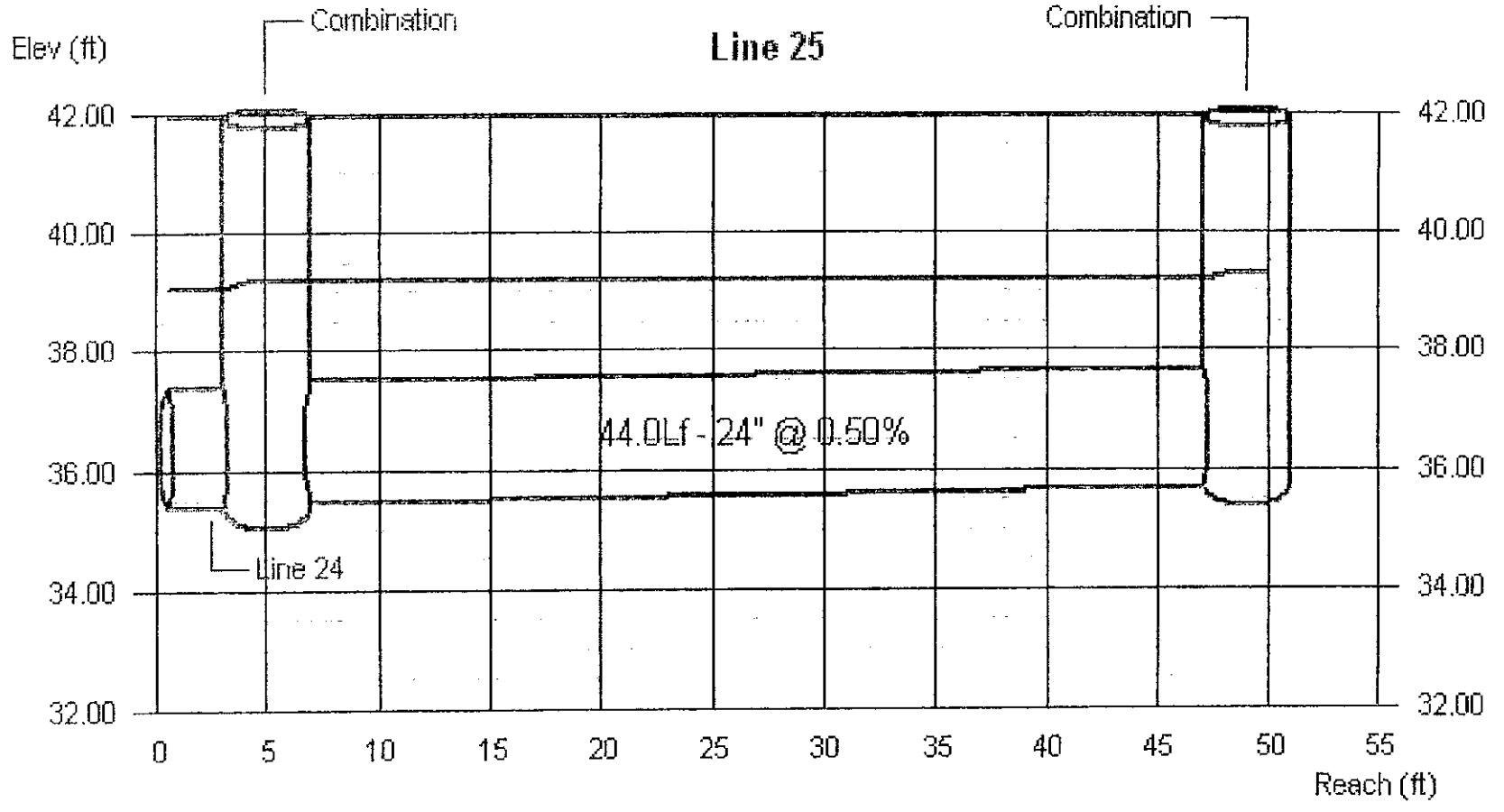

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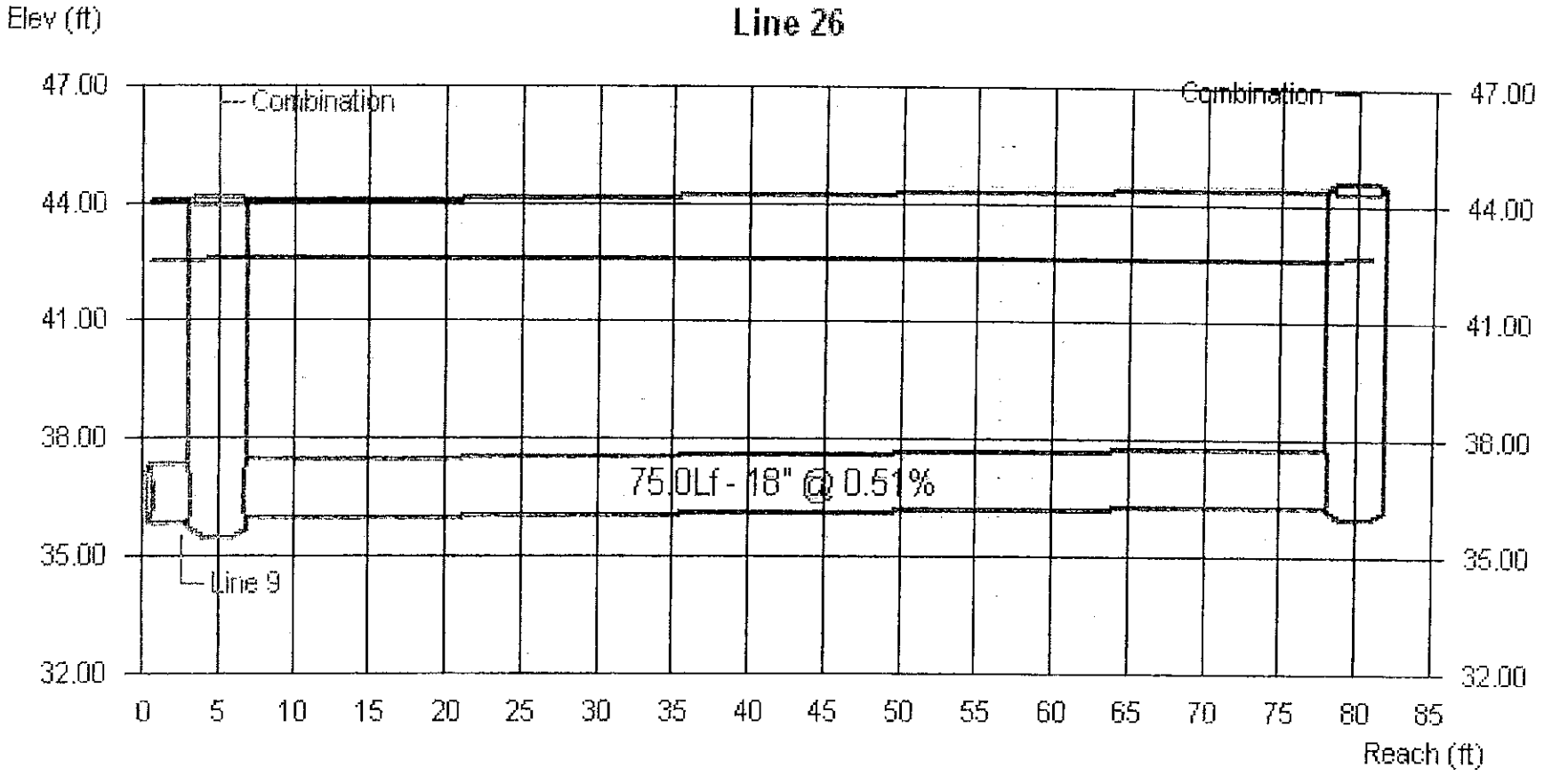

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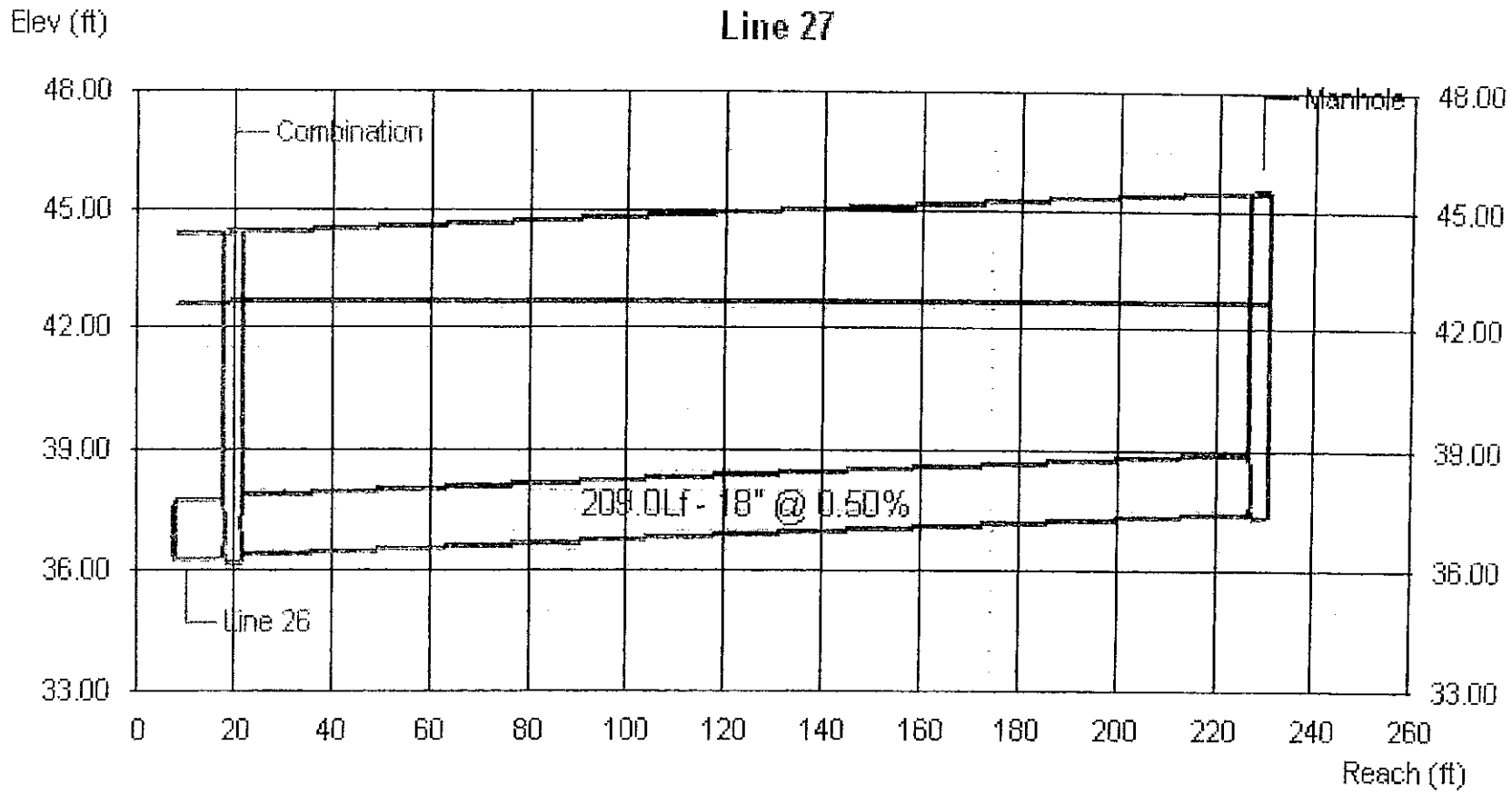

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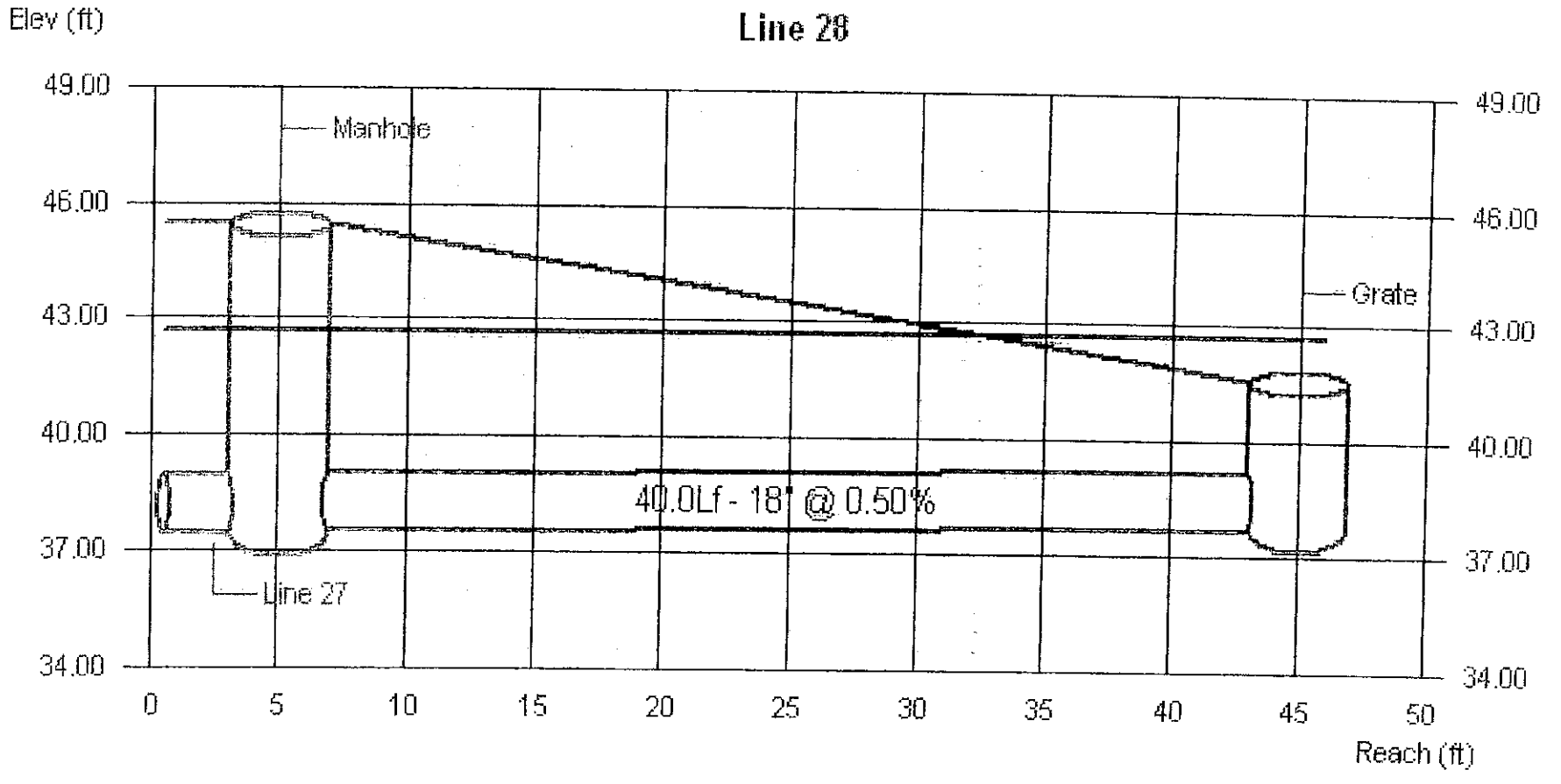

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