

Jason Grimshaw, Chair
Leicester Planning Board
3 Washburn Square
Leicester, Massachusetts 01524

January 23, 2023

RE: Definitive Subdivision Plan-Peer Review
#1355 Main Street
ZP Battery Devco, LLC
Map 26/Parcel A1

Dear Mr. Grimshaw,

Hannigan Engineering, Inc. is in receipt of comments from Quinn Engineering, Inc. regarding the submittal of Definitive Subdivision Plan prepared by this office in Leicester, Massachusetts. We have reviewed the comments and offer our responses below. We have left the same format of their letter for ease of review. These responses have been incorporated into the updated plans for final review and approval by the Board.

Waivers:

Comment #1: §V.A.4, b, Dead End Streets. Waiver requested to permit a T-turnaround in lieu of the required cul-de-sac.

A cul-de-sac allows emergency apparatus to reverse direction without need of backing. The T-turnaround requires a three-point turn to reverse direction, but requires much less impervious asphalt area. This office has no objection to the use of a T-turnaround on this small project, however it is recommended that Leicester Planning Board seek input from Leicester Police, Fire and Highway Departments

Response: Acknowledged.

Comment #2: §VI.B.1, Storm Drainage System. Waiver requested to permit HDPE drainage lines in lieu of reinforced concrete pipe.

The use of HDPE pipe as drainage culvert has been permitted and even requested by Leicester Highway Department in the past. This product is long-lived and performs well, if correctly designed and installed. We do not object to this requested waiver.

A waiver should specify double wall HDPE pipe, with smooth interior.

Response: An updated waiver request list has been added to the end of this letter, reflecting double wall HDPE with smooth interior.

Comment #3: §VI.G, Sidewalks. Waiver requested from requirement for sidewalks.

We defer to Leicester Planning Board on this non engineering-related waiver request.

Response: Acknowledged.

Comment #4: §VI.J, Curbing. Waiver requested from requirement for granite gutter inlets at catch basins.

The Board may wish to seek input from Leicester Highway Department on this requested waiver; in the past LHD has requested that granite gutter inlets not be installed, due to problems with snow plowing operations. We do not object to this requested waiver.

Response: Acknowledged.

Comment #5: §VI.R.3, Pavement Width, Industrial Subdivisions. Waiver requested to permit reduction of pavement width to 20 feet, from required width of 36 feet.

Response: See response for Comment #6.

Comment #6: §VI.R.4, Berm Radii, Industrial Subdivisions. Waiver requested to permit reduction of the radius of curvature of berm at the entrance to Main Street of 20 feet in lieu of required 50 feet.

§VI.R.3 and §VI.R.4 pertain to road geometry required to accommodate vehicles using the roadway, and entering and departing the subdivision. As a public road which services an industrial subdivision, the road should be capable of accommodating tractor-trailers or other large vehicles.

There is a safety concern for larger vehicles departing the project and entering Main Street, particularly in the southbound direction. Vehicles must be able to make the swing onto Main Street without crossing the centerline. If the width of the proposed road and/or the rounding of the curb are so narrow that trucks are unable to make the turn onto Main Street without crossing into the opposite travel lane, a serious safety hazard will exist. The Engineer must submit diagrams documenting the turning maneuvers for large vehicles, including tractor-trailers. It is the opinion of this office that a municipal road should safely accommodate large vehicles, irrespective of what type of vehicle might be expected to use the subdivision.

Response: As reviewed during the Preliminary Subdivision submittal with the Board, the likelihood of larger trucks, such as a WB-67, entering the two lots is unlikely as the property size and extreme topographical change would limit the size of a proposed development. This would inherently lead to a use which wouldn't typically require these larger vehicles.

Nonetheless, for the purposes of this review a WB-50 vehicle, was modeled turning into and out of this site ascertain the ability to accommodate larger vehicles entering the site. To accommodate these larger vehicles the proposed roadway has been increased to 26-feet and the entrance radii increased to 50-feet to account for the swing of the trailer entering and exiting the site. It is anticipated that when the lots get developed these larger trucks would enter into their respective properties, perform their function and then exit the site. As such actual reverse direction turning maneuvers would not occur within the T-Turnaround of the subdivision.

Comment#7: §VI.K. Grading of Slopes. Waiver requested to permit embankment sideslopes of 1.5:1 in lieu of required 3:1 sideslopes.

The proposed sideslopes of 1.5:1 risk slope stability problems, but that concern is further complicated because the plans require building embankment soils to an exceptional height of 46 feet in some areas. These factors together create conditions which warrant assessment by a qualified geotechnical engineer. We do not recommend a conditional approval of this waiver. It is likely that a geotechnical engineering assessment will require construction controls and possible design features that ensure stability.

Response: The originally approved sideslopes of 1.5:1 have been eliminated. In lieu of these slopes, a retaining wall system has been incorporated into the Plan with side slopes of not more than 3:1. The exception to this is the easterly sideslope which will utilize a rip-rap stabilized slope at a ratio of 2:1.

Comment #8: §VI.R.7, Pavement Markings. Waiver requested of requirements for pavement markings.

We do not object to waiving pavement markings on this short section of roadway.

Response: Acknowledged.

Plan Comments

Comment #1: Regarding plan contents:

- a.) Plans should propose a street name (REF: §IV, 2, d)
- b.) Plan of Land should identify the material and dimensional requirements of bounds. (REF: §VI, H, "Monuments")
- c.) Each sheet of the plans should include a signature block, for signing by Planning Board members. (REF: §IV, 2, i)

Response: The Plans have been updated with the applicable information.

Comment #2: Domestic water will be supplied to each lot by services extended from water mains on Main Street, across the highway from the site. As a result, no water main is proposed within the subdivision, and no fire hydrants will exist onsite. The nearest hydrant is located on Main Street, across the road from the site. In the event of a fire onsite, firefighting operations will require laying hoses across Main Street, impeding traffic and firefighting operations. Leicester Planning Board may wish to seek input from Leicester Fire Department.

Response: An additional 8" water main has been extended into the proposed subdivision roadway with a terminal flushing hydrant to provide additional water access for firefighting operations.

Comment #3: Plans call for guardrail around the T-turnaround at the end of Road A, but not along the straight sections of the road. Massachusetts Department of Transportation publishes a warrant for the installation of guardrail, which requires guardrail installation on almost all roadways with embankment sideslopes steeper than 3:1. The Engineer must evaluate the requirement for guardrail on all sections of Road A, and specify guardrail accordingly.

Response: As part of the reconfiguration of the Subdivision, the slope along the shoulder of the roadway has been regraded at a slope of 4:1 with a block retaining wall system to prevent excessive filling of land associated with the roadway construction. With the noted exception along the easterly side of the roadway slope. Due to the filling and elevation relief the guardrail has been extended along the entirety of the easterly portion of the roadway, and around the turnaround area. In addition the retaining wall system will also utilize a security fence as a means of fall protection providing a further level of protection along the roadway.

Comment #4: On the Emergency Vehicle Turning Maneuver diagrams provided, the blue lines overlap berm in several locations. The blue lines are not defined, but may depict vehicle "overhang" and not actual tire paths. Engineer should clarify.

Response: The provided Emergency Vehicle Turning Maneuver diagrams depict both the path of the outer edge of the vehicle tire, as shown in red, and the overhang of the vehicle depicted as blue. These diagrams have been revised to depict this color scheme

Comment #5: Plans call for timber guardrail, an attractive product but which has a shorter life than conventional steel guardrail. Leicester Planning Board may wish to require steel guardrail, which will likely provide many more years of service than timber.

Response: The Leicester Subdivision Regulations do not specify materials for guardrails. As such a timber guardrail is proposed as a means of controlling construction costs on the project. It is noted that the intent is the roadway would remain private and the maintenance and upkeep on the roadway and its associated infrastructure would be borne by the developer or landowner of the roadway.

Drainage and Hydrology

Comment #6: Plans should require a concrete manway to the cleanout opening in the stormwater chamber gallery, to permit inspection and maintenance activities. Manway should have a traffic rated manhole frame and cover at the surface.

Response: A manway has been incorporated into the first chamber of the inlet into the subsurface system.

Comment #7: Rainfall figures applied in the Hydrology analysis do not appear to be based on current NOAA rainfall statistics. The following 24 hour storm data is recommended:

- a.) 2 year: 3.13 inches*
- b.) 10 year: 4.85 inches*
- c.) 50 year: 6.72 inches*
- d.) 100 year: 7.59 inches*

Response: The rainfall data has been updated to reflect NOAA (Atlas-14) statistical rainfall data.

Comment#8: Plans must specify that the stormwater chambers be constructed so as to sustain HS-20 wheel loads.

Response: Per the manufacturer, HS-20 Loading is achieved with a minimum cover of 12". Additional notations have been provided to the construction details dictating HS-20 requirement, in the event another product manufacturer is utilized.

Comment #9: A 4 inch diameter underdrain is called out beneath the base of the chamber gallery. The gallery is a BMP designed to infiltrate treated stormwater back into the ground; an underdrain defeats the purpose of recharging stormwater. The drain could be equipped with a hand-operated valve in manhole UGS#1B, to permit draining water in the event of a malfunction.

Response: The 4-inch subdrain feature is a utilized as a means to provide three primary functions a low-flow discharge during smaller storm events, ensure drawdown of stormwater upon the completion of a storm event and to prevent groundwater intrusion. The subdrain system is utilized as means to provide peak rate mitigation and is included within the drainage modeling calculations.

It is also noted that the project is located within an area of hydrological C (HSG-C) soil. Such, compliance with recharge requirements of stormwater management and stormwater bylaw is required to the maximum extent practicable.

Comment #10: Engineer must document that the Hydroworks stormwater treatment unit has sufficient capacity to meet the requirement for removal of 80% total suspended solids at all flow rates.

Response: Documentation relative to the Hydroworks TSS removal efficiency is included in the stormwater report as well as the Water Quality Flow Calculations documenting the unit has the capacity to accommodate the anticipated flows are included within the Drainage Report and Analysis.

Comment#11: Plans should include a detail for the straw wattle/silt fence erosion controls.

Response: The detail has been updated to reflect the title of "Straw Wattle and Silt Fence".

Waivers - Amended:

Section V.A.4.b – Design Standards

– Dead end Streets:

A Waiver is requested for the requirement to provide a cul-de-sac with a radius of 100-feet at the end of the proposed roadway. It is proposed that a T-turnaround be constructed to provide vehicles the ability to turn around at the end of the roadway.

Section VI.B.1 – Required Improvements for an Approved Subdivision

– Storm Drainage System:

A waiver is requested to utilize double wall high density polypropylene (HDPE) with smooth interior drainage lines within the drainage system of the subdivision.

Section VI.G – Required Improvements for an Approved Subdivision

– Sidewalks:

A waiver is requested for the requirements of sidewalks on this project. The development is non-residential in nature and would not typically lend itself to the need of sidewalks. Additionally, there are no sidewalks on Main Street to which sidewalks from the development would connect.

Section VI.J – Required Improvements for an Approved Subdivision

– Curbing:

A waiver is requested for the requirement of granite curb inlets at the catchbasins within the subdivision roadway.

Section VI.K – Required Improvements for an Approved Subdivision

– Grading of Slopes:

A waiver is requested for the requirement of the slope grading being no more than 1 foot vertical to 3 feet horizontal in fill. Due to the sharp topography change along Main Street to the property a slope of 1 foot vertical to 2-feet horizontal (2:1) is proposed to minimize disturbance along the existing Main Street Right of Way. This area of 2:1 slopes, stone stabilization methods will be utilized to provide long term stability. Unlike other riprap applications where stone is "dumped" along the slope, this method of stabilization requires the contractor to carefully place the larger stones along the slope to ensure stability. In addition, this slope will be located within an easement in perpetuity should maintenance and/or repair of this slope be required.

Along the rear portion of the roadway and to maintain an appropriate setback from the nearby wetland areas a block retaining wall will be constructed.

Section VI.R.3 – Required Improvements for an Approved Subdivision

– Pavement Width (Industrial Subdivision):

A waiver is requested for the requirement of 36 feet of pavement for the roadway. The roadway is proposed to be 26-feet wide due to its limited length and access requirements.

Section VI.R.4 – Required Improvements for an Approved Subdivision

– Berm Radii:

Waiver request is formally withdrawn.

Section VI.R.7 – Required Improvements for an Approved Subdivision

– Pavement Markings:

A waiver is requested for the requirement of pavement markings for the roadway.

This information is being provided as part of the review of a Definitive Subdivision Plan submitted to the Town of Leicester. As discussed above, additional modifications and revisions to the plans were required based upon the Peer Review by the peer reviewer Quinn Engineering, Inc. The plans have been updated to reflect these modifications and revisions and are submitted herewith for final review. We look forward to the Board's anticipated approval of this project.

Hannigan Engineering, Inc. would like to thank the Town and its staff for its assistance and continued cooperation regarding this project.

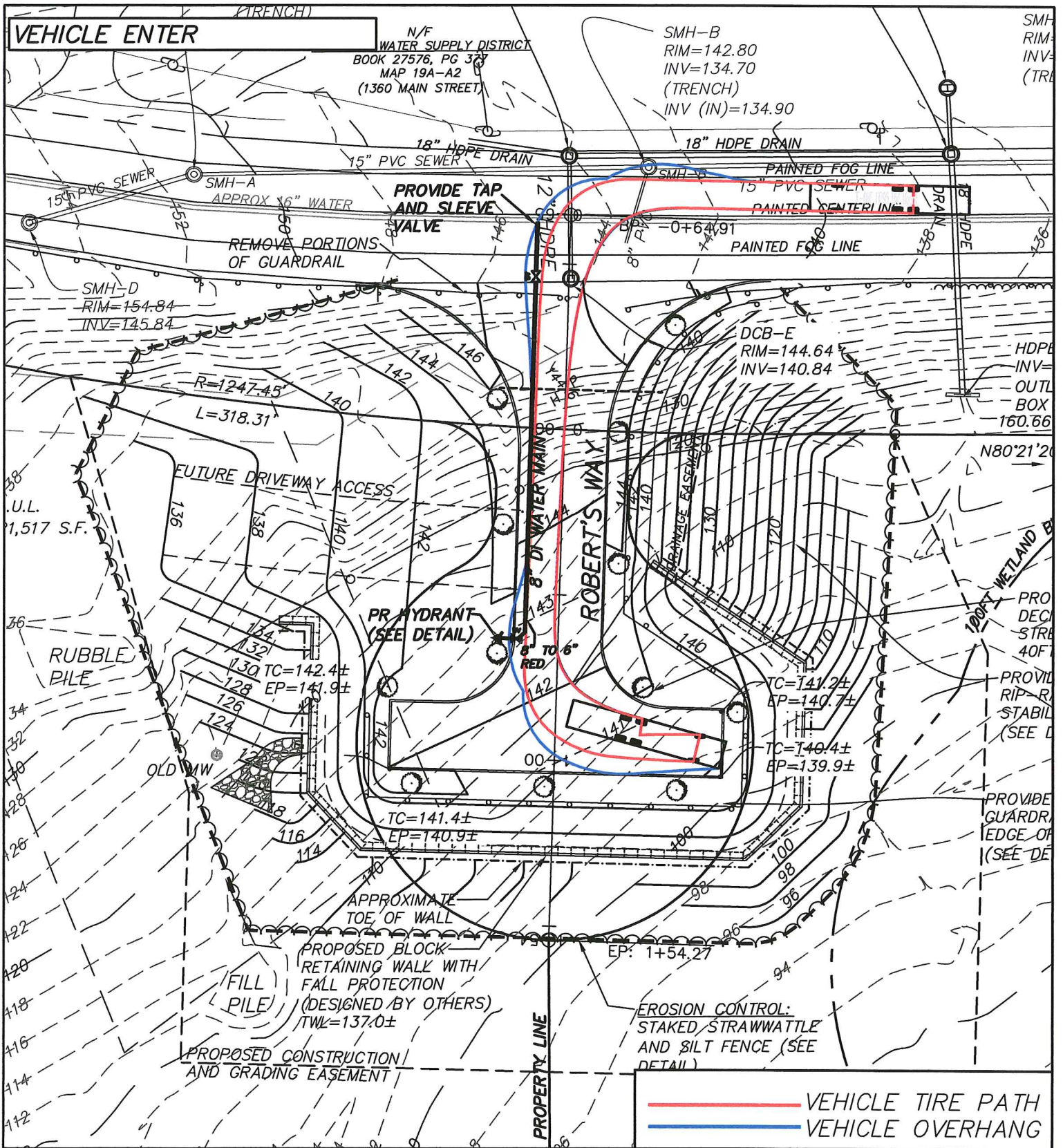
Sincerely,
HANNIGAN ENGINEERING, INC.



Christopher Anderson, PE
Project Engineer

pc: Brendan Gove – ZP Battery DevCo, LLC
Pete Forte – ZP Battery DevCo, LLC
Tom Corbett – ZP Battery DevCo, LLC

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Comment-Response 1.docx



HANNIGAN ENGINEERING, INC.

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EMERGENCY VEHICLE TURNING MANEUVER

NOV 30, 2022; REVISED JAN 23, 2023
SCALE: 1:40

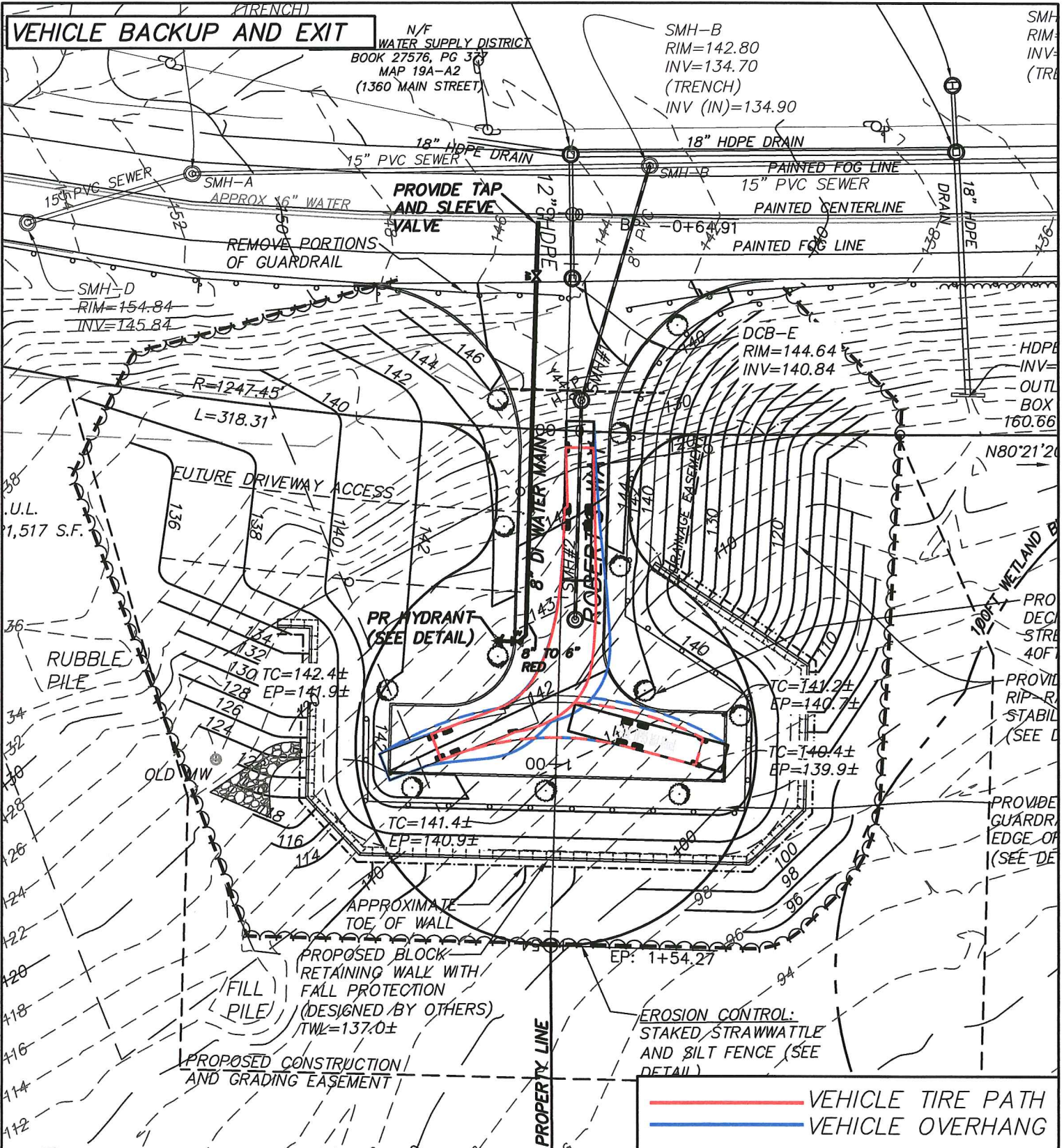
PREPARED FOR:
ZP BATTERY DEVCO, LLC
BRENDON GOVE
10 E. WORCESTER STREET, SUIT 3A WORCESTER,
MASSACHUSETTS 01604

VEHICLE BACKUP AND EXIT

N/F
WATER SUPPLY DISTRICT
BOOK 27576, PG 373
MAP 19A-A2
(1360 MAIN STREET)

SMH-B
RIM=142.80
INV=134.70
(TRENCH)
INV (IN)=134.90

SMH
RIM
INV
(TR



— VEHICLE TIRE PATH
— VEHICLE OVERHANG

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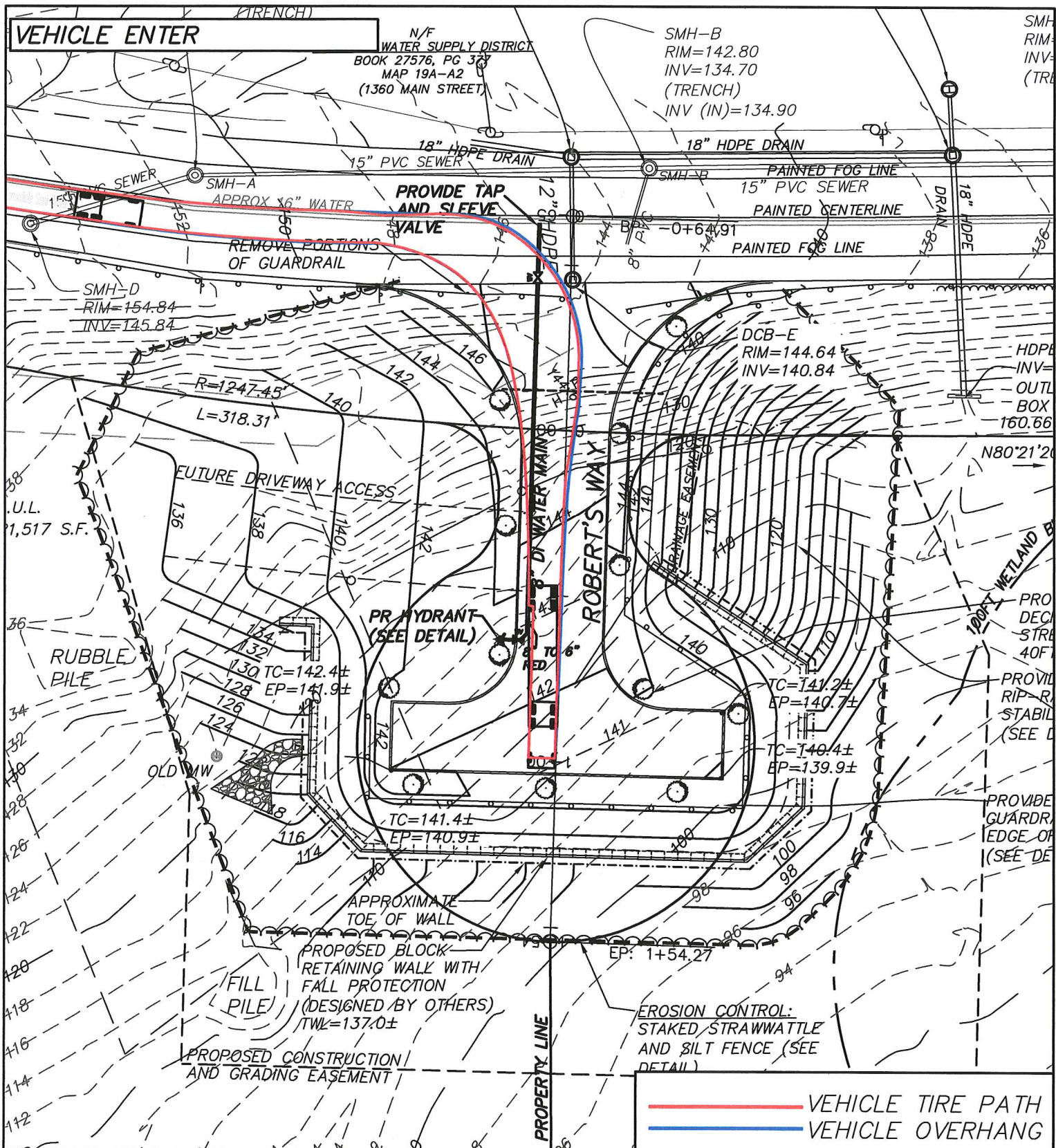
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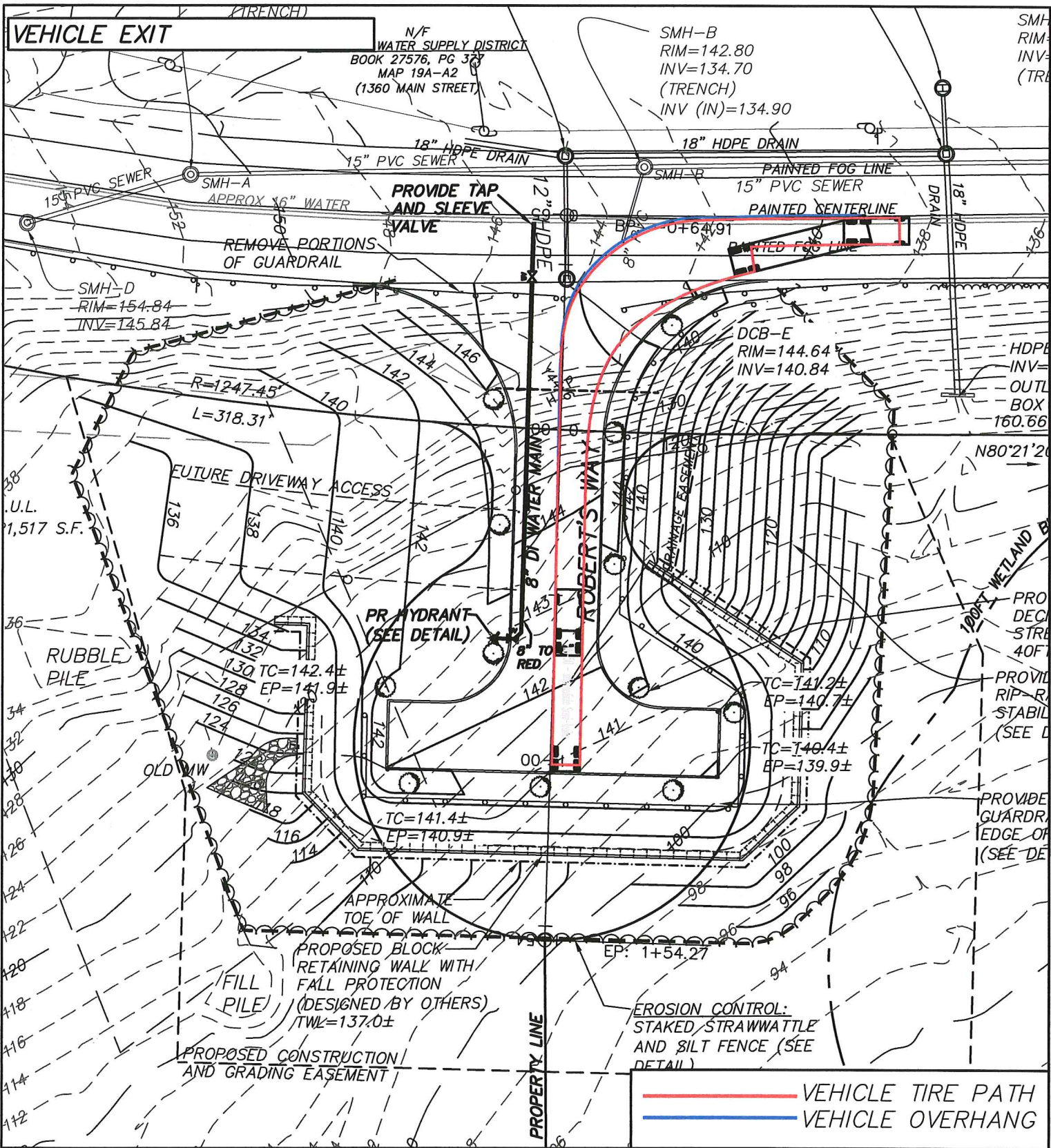
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WB-50 VEHICLE TURNING MANEUVER

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