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diary on          % begin recording

% FEMA appeal for The Town of Kennebunkport, York county, Maine
% TRANSECT ID: YK-109
% calculation by SJH, Ransom Consulting, Inc. 02-Apr-2020
% 100-year wave runup using TAW methodology
% including berm and weighted average with foreshore if necessary
%
% chk nld 20200220
%
% This script assumes that the incident wave conditions provided
% as input in the configuration section below are the
% appropriate values located at the end of the foreshore
% or toe of the slope on which the run-up is being calculated
% the script does not attempt to apply a depth limit or any other
% transformation to the incident wave conditions other than
% conversion of the peak wave period to the spectral mean wave
% as recommended in the references below
%
% references:
%
% Van der Meer, J.W., 2002. Technical Report Wave Run-up and
% Wave Overtopping at Dikes. TAW Technical Advisory Committee on
% Flood Defence, The Netherlands.
%
% FEMA. 2007, Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update
%
%
%-----
% CONFIG
%-----
fname='inpfiles/YK-109sta_ele_include.csv'; % file with station, elevation, include
                                         % third column is 0 for excluded points
imgname='logfiles/YK-109-runup';
SWEL=9.0102; % 100-yr still water level including wave setup.
H0=5.2103; % significant wave height at toe of structure
Tp=13.7882; % peak period, 1/fma,
T0=Tp/1.1;

gamma_berm=0.61088; % this may get changed automatically below
gamma_rough=0.6;
gamma_beta=1;
gamma_perm=1;

setupAtToe=0.19397;
maxSetup=0.8081; % only used in case of berm/shallow foreshore weighted average

plotTitle='Iterative TAW for YK-109'

plotTitle =

Iterative TAW for YK-109

% END CONFIG
%-----

SWEL=SWEL+setupAtToe

SWEL =

          9.20417

SWEL_fore=SWEL+maxSetup

SWEL_fore =

          10.01227

% FIND WAVELENGTH USING DEEPWATER DISPERSION RELATION
% using English units
L0=32.15/(2*pi)*T0^2

L0 =

          803.953420258207

% Find Hb (Munk, 1949)
%Hb=H0/(3.3*(H0/L0)^(1/3))
%Db=-Hb/.78+SWEL; % depth at breaking

% The toe elevation here is only used to determine the average
% structure slope, it is not used to depth limit the wave height.
% Any depth limiting or other modification of the wave height

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% to make it consistent with TAW guidance should be performed
% prior to the input of the significant wave height given above.
Ztoe=SWEL-1.5*H0

Ztoe =

    1.38872

% read the transect
[sta,dep,inc] = textread(fname,'%n%n%n%[^\\n]','delimiter',' ','headerlines',0);

% remove unselected points
k=find(inc==0);
sta(k)=[];
dep(k)=[];

sta_org=sta; % used for plotting purposes
dep_org=dep;

% initial guess at maximum run-up elevation to estimate slope
Z2=SWEL+1.5*H0

Z2 =

    17.01962

% determine station at the max runup and -1.5*H0 (i.e. the toe)
top_sta=-999;
toe_sta=-999;
for kk=1:length(sta)-1
    if ((Z2 > dep(kk)) & (Z2 <= dep(kk+1))) % here is the intersection of z2 with profile
        top_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Z2)
    end
    if ((Ztoe > dep(kk)) & (Ztoe <= dep(kk+1))) % here is the intersection of Ztoe with profile
        toe_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Ztoe)
    end
end
toe_sta =

    51.2594075418113

% check to make sure we got them, if not extend the end slopes outward
S=diff(dep)./diff(sta);
if toe_sta== -999
    dy=dep(1)-Ztoe;
    toe_sta=sta(1)-dy/S(1)
end
if top_sta== -999
    dy=Z2-dep(end);
    top_sta=sta(end)+dy/S(end)
end
top_sta =

    361.488926197972

% just so the reader can tell the values aren't -999 anymore
top_sta

top_sta =

    361.488926197972

toe_sta

toe_sta =

    51.2594075418113

% check for case where the toe of slope is below SWL-1.5*H0
% in this case interpolate setup from the setupAtToe(really setup as first station), and the max setup
% also un-include points seaward of SWL-1.5*H0
if Ztoe > dep(1)
    dd=SWEL_fore-dep;
    k=find(dd<0,1); % k is index of first land point
    staAtSWL=interp1(dep(k-1:k),sta(k-1:k),SWEL_fore);
    dsta=staAtSWL-sta(1);
    dsetup=maxSetup-setupAtToe;
    dsetdsta=dsetup/dsta;
    setup=setupAtToe+dsetdsta*(toe_sta-sta(1));
    sprintf('!!- Location of SWEL-1.5*H0 is %4.1f ft landward of toe of slope',dsta)
    sprintf('!!- Setup is interpolated between setup at toe of slope and max setup')

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    sprintf('!!!-      setup is adjusted to %4.2f feet',setup)
    SWEL=SWEL-setupAtToe+setup;
    sprintf('!!!-      SWEL is adjusted to %4.2f feet',SWEL)
    k=find(dep < SWEL-1.5*H0)
    sta(k)=[];
    dep(k)=[];
else
    sprintf('!!!- The User has selected a starting point that is %4.2f feet above the elevation of SWEL-1.5H0\n',dep(1)
    sprintf('!!!- This may be reasonable for some cases. However the user may want to consider:\n')
    sprintf('!!!-      1) Selecting a starting point that is at or below %4.2f feet elevation, or\n', Ztoe)
    sprintf('!!!-      2) Reducing the incident wave height to a depth limited condition.\n')
end

ans =

-!!!- Location of SWEL-1.5*H0 is 250.9 ft landward of toe of slope

ans =

-!!!- Setup is interpolated between setup at toe of slope and max setup

ans =

-!!!-      setup is adjusted to 0.26 feet

ans =

-!!!-      SWEL is adjusted to 9.27 feet

k =

    1
    2
    3
    4
    5
    6
    7
    8
    9
   10
   11
   12
   13
   14
   15
   16
   17
   18
   19
   20
   21
   22
   23
   24
   25
   26
   27
   28

% now iterate converge on a runup elevation
tol=0.01; % convergence criteria
R2del=999;
R2_new=3*H0; %initial guess
R2=R2_new;
iter=0;
R2_all=[];
topStaAll=[];
Berm_Segs=[];
TAW_ALWAYS_VALID=1;
while(abs(R2del) > tol && iter <= 25)
    iter=iter+1;
    sprintf('!----- STARTING ITERATION %d -----!',iter)
    % elevation of toe of slope
    Ztoe
    % station of toe slope (relative to 0-NAVD88 shoreline)
    toe_sta
    % station of top of slope/extent of 2% run-up
    top_sta
    % elevation of top of slope/extent of 2% run-up
    Z2
    % incident significant wave height
    H0

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% incident spectral peak wave period
Tp
% incident spectral mean wave period
T0

R2=R2_new
Z2=R2+SWEL
% determine slope for this iteration
top_sta=-999;
for kk=1:length(sta)-1
    if ((Z2 > dep(kk)) & (Z2 <= dep(kk+1))) % here is the intersection of z2 with profile
        top_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Z2)
        break;
    end
end
if top_sta== -999
    dy=Z2-dep(end);
    top_sta=sta(end)+dy/S(end)
end

% get the length of the slope (not accounting for berm)
Lslope=top_sta-toe_sta

% loop over profile segments to determine berm factor
% re-calculate influence of depth of berm based on this run-up elevation
% check for berm, berm width, berm height
berm_width=0;
rdh_sum=0;
Berm_Segs=[];
Berm_Heights=[];
for kk=1:length(sta)-1
    ddep=dep(kk+1)-dep(kk);
    dsta=sta(kk+1)-sta(kk);
    s=ddep/dsta;
    if (s < 1/15) % count it as a berm if slope is flatter than 1:15 (see TAW manual)
        sprintf('Berm Factor Calculation: Iteration %d, Profile Segment: %d',iter, kk)
        berm_width=berm_width+dsta; % tally the width of all berm segments
        % compute the rdh for this segment and weight it by the segment length
        dh=SWEL-(dep(kk)+dep(kk+1))/2
        if dh < 0
            chi=R2;
        else
            chi=2* H0;
        end
        if (dh <= R2 & dh >=-2*H0)
            rdh=(0.5-0.5*cos(3.14159*dh/chi)) ;
        else
            rdh=1;
        end
        rdh_sum=rdh_sum + rdh * dsta
        Berm_Segs=[Berm_Segs, kk];
        Berm_Heights=[Berm_Heights, (dep(kk)+dep(kk+1))/2];
    end
    if dep(kk) >= Z2 % jump out of loop if we reached limit of run-up for this iteration
        break
    end
end
sprintf('!----- End Berm Factor Calculation, Iter: %d -----!',iter)
berm_width
rB=berm_width/Lslope
if (berm_width > 0)
    rdh_mean=rdh_sum/berm_width
else
    rdh_mean=1
end
gamma_berm=1- rB * (1-rdh_mean)
if gamma_berm > 1
    gamma_berm=1
end
if gamma_berm < 0.6
    gamma_berm =0.6
end
% Iribarren number
slope=(Z2-Ztoe)/(Lslope-berm_width)
Irb=(slope/(sqrt(H0/L0)))
% runup height
gamma_berm
gamma_perm
gamma_beta
gamma_rough
gamma=gamma_berm*gamma_perm*gamma_beta*gamma_rough

% check validity
TAW_VALID=1;
if (Irb*gamma_berm < 0.5 | Irb*gamma_berm > 10 )
    sprintf('!!! - - Iribarren number: %6.2f is outside the valid range (0.5-10), TAW NOT VALID - - !!!\n', Irb*gamma_berm)
    TAW_VALID=0;
else
    sprintf('!!! - - Iribarren number: %6.2f is in the valid range (0.5-10), TAW RECOMMENDED - - !!!\n', Irb*gamma_berm)
end

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islope=1/slope;
if (slope < 1/8 | slope > 1)
    sprintf('!!! - - slope: 1:%3.1f V:H is outside the valid range (1:8 - 1:1), TAW NOT VALID - - !!!\n', islope)
    TAW_VALID=0;
else
    sprintf('!!! - - slope: 1:%3.1f V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!\n', islope)
end
if TAW_VALID == 0
    TAW_ALWAYS_VALID=0;
end

if (Irb*gamma_berm < 1.8)
    R2_new=gamma*H0*1.77*Irb
else
    R2_new=gamma*H0*(4.3-(1.6/sqrt(Irb)))
end

% check to see if we need to evaluate a shallow foreshore
if berm_width > 0.25 * L0;
    disp('!   Berm_width is greater than 1/4 wave length')
    disp('!   Runup will be weighted average with foreshore calculation assuming depth limited wave height on berm')
    % do the foreshore calculation
    fore_H0=0.78*(SWEL_fore-min(Berm_Heights))
    % get upper slope
    fore_toe_sta=-999;
    fore_toe_dep=-999;
    for kk=length(dep)-1:-1:1
        ddep=dep(kk+1)-dep(kk);
        dsta=sta(kk+1)-sta(kk);
        s=ddep/dsta;
        if s < 1/15
            break
        end
        fore_toe_sta=sta(kk);
        fore_toe_dep=dep(kk);
        upper_slope=(Z2-fore_toe_dep)/(top_sta-fore_toe_sta)
    end
    fore_Irb=upper_slope/(sqrt(fore_H0/L0));
    fore_gamma=gamma_perm*gamma_beta*gamma_rough;
    if (fore_Irb < 1.8)
        fore_R2=fore_gamma*fore_H0*1.77*fore_Irb;
    else
        fore_R2=fore_gamma*fore_H0*(4.3-(1.6/sqrt(fore_Irb)));
    end
    if berm_width >= L0
        R2_new=fore_R2
        disp('berm is wider than one wavelength, use full shallow foreshore solution');
    else
        w2=(berm_width-0.25*L0)/(0.75*L0)
        w1=1-w2
        R2_new=w2*fore_R2 + w1*R2_new
    end
end % end berm width check
% convergence criterion
R2del=abs(R2-R2_new)
R2_all(iter)=R2_new;
% get the new top station (for plot purposes)
Z2=R2_new+SWEL
top_sta=-999;
for kk=1:length(sta)-1
    if ((Z2 > dep(kk)) & (Z2 <= dep(kk+1))) % here is the intersection of z2 with profile
        top_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Z2)
        break;
    end
end
if top_sta== -999
    dy=Z2-dep(end);
    top_sta=sta(end)+dy/S(end);
end
topStaAll(iter)=top_sta;

end
ans =
!----- STARTING ITERATION 1 -----!
Ztoe =
    1.38872
toe_sta =
    51.2594075418113
top_sta =
    361.488926197972
Z2 =
    17.01962
H0 =
    5.2103
Tp =
    13.7882
T0 =
    12.5347272727273
R2 =
    15.6309

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```
Z2 =
    24.8993453256456
top_sta =
    416.611174016409
Lslope =
    365.351766474598
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 1
dh =
    7.76611882564563
rdh_sum =
    0.848255617431113
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 2
dh =
    7.71541532564563
rdh_sum =
    1.69098654792369
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 3
dh =
    7.66471132564563
rdh_sum =
    2.52811265393303
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 4
dh =
    7.61400732564563
rdh_sum =
    3.3595551616345
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 5
dh =
    7.58592132564563
rdh_sum =
    4.18781598962189
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 6
dh =
    7.58045332564563
rdh_sum =
    5.01545463942327
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 7
dh =
    7.57498532564563
rdh_sum =
    5.84247022067872
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 8
dh =
    7.56951732564563
rdh_sum =
    6.66886184472152
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 9
dh =
    7.56404932564563
rdh_sum =
    7.49462862458054
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 10
dh =
    7.55858132564563
rdh_sum =
    8.31976967498268
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 11
dh =
    7.55311282564563
rdh_sum =
    9.14428405501672
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 12
dh =
    7.54764432564563
rdh_sum =
    9.96817088265169
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 13
dh =
    7.54217632564563
rdh_sum =
    10.7914293350618
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 14
dh =
    7.53670832564563
rdh_sum =
    11.6140585337903
```

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ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 15  
dh =  
    7.53124032564563  
rdh_sum =  
    12.4360576020906  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 16  
dh =  
    7.52577232564563  
rdh_sum =  
    13.2574256649283  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 17  
dh =  
    7.49679182564563  
rdh_sum =  
    14.0754348482489  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 18  
dh =  
    7.44429832564563  
rdh_sum =  
    14.8872983329729  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 19  
dh =  
    7.39180482564563  
rdh_sum =  
    15.692938013876  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 20  
dh =  
    7.33931132564563  
rdh_sum =  
    16.4922773444658  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 21  
dh =  
    7.28681782564563  
rdh_sum =  
    17.2852413561528  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 22  
dh =  
    7.23432432564563  
rdh_sum =  
    18.071756677026  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 23  
dh =  
    7.18183082564563  
rdh_sum =  
    18.8517515502285  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 24  
dh =  
    7.12933782564563  
rdh_sum =  
    19.6251559150329  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 25  
dh =  
    7.07684432564563  
rdh_sum =  
    20.3919012357362  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 26  
dh =  
    7.02435082564563  
rdh_sum =  
    21.1519207068156  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 27  
dh =  
    6.98947032564563  
rdh_sum =  
    21.9074349174411  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 28  
dh =  
    6.97220282564563  
rdh_sum =  
    22.6607083236397  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 29  
dh =  
    6.95493532564563  
rdh_sum =  
    23.4117340616669
```

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ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 30  
dh =  
    6.93766732564563  
rdh_sum =  
    24.160505263312  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 31  
dh =  
    6.92039982564563  
rdh_sum =  
    24.9070152520235  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 32  
dh =  
    6.90313232564563  
rdh_sum =  
    25.6512573473466  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 33  
dh =  
    6.88586482564563  
rdh_sum =  
    26.3932249302866  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 34  
dh =  
    6.86859732564563  
rdh_sum =  
    27.1329114434886  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 35  
dh =  
    6.85132982564563  
rdh_sum =  
    27.8703103914149  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 36  
dh =  
    6.83492582564563  
rdh_sum =  
    28.605530208927  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 37  
dh =  
    6.82024832564563  
rdh_sum =  
    29.3387953685961  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 38  
dh =  
    6.80643432564563  
rdh_sum =  
    30.0702166930533  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 39  
dh =  
    6.79261982564563  
rdh_sum =  
    30.7997901015478  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 40  
dh =  
    6.77880532564563  
rdh_sum =  
    31.5275116120467  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 41  
dh =  
    6.76499132564563  
rdh_sum =  
    32.2533773418801  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 42  
dh =  
    6.75117732564563  
rdh_sum =  
    32.9773833736096  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 43  
dh =  
    6.73736332564563  
rdh_sum =  
    33.6995258220515  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 44  
dh =  
    6.72354932564563  
rdh_sum =  
    34.4198008343446
```



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ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 45
dh =
    6.70973532564563
rdh_sum =
    35.1382045900163
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 46
dh =
    6.68095632564563
rdh_sum =
    35.852697788433
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 47
dh =
    6.63721182564563
rdh_sum =
    36.5612160567695
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 48
dh =
    6.59346732564563
rdh_sum =
    37.2637231291401
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 49
dh =
    6.54972282564563
rdh_sum =
    37.9601837851373
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 50
dh =
    6.50597782564563
rdh_sum =
    38.6505637862654
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 51
dh =
    6.46223332564563
rdh_sum =
    39.3348300905878
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 52
dh =
    6.41848882564563
rdh_sum =
    40.0129506501654
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 53
dh =
    6.38239932564563
rdh_sum =
    40.685977561138
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 54
dh =
    6.36162082564563
rdh_sum =
    41.356062478056
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 55
dh =
    6.34849782564563
rdh_sum =
    42.0242858846649
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 56
dh =
    6.33537432564563
rdh_sum =
    42.6906450767993
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 57
dh =
    6.32225082564563
rdh_sum =
    43.3551374503503
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 58
dh =
    6.30256582564563
rdh_sum =
    44.0168248129168
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 59
dh =
    6.26975732564563
rdh_sum =
    44.6738245276504
```

```
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 60  
dh =  
    6.23038732564563  
rdh_sum =  
    45.3251788594287  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 61  
dh =  
    6.19101732564563  
rdh_sum =  
    45.9708664859469  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 62  
dh =  
    6.15164732564563  
rdh_sum =  
    46.6108668832074  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 63  
dh =  
    6.12039282564563  
rdh_sum =  
    47.2463383003591  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 64  
dh =  
    6.10536982564563  
rdh_sum =  
    47.8796284822891  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 65  
dh =  
    6.09846282564563  
rdh_sum =  
    48.511914895596  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 66  
dh =  
    6.09155582564563  
rdh_sum =  
    49.1431969666819  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 67  
dh =  
    6.08464882564563  
rdh_sum =  
    49.7734741263038  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 68  
dh =  
    6.07774182564563  
rdh_sum =  
    50.4027458095758  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 69  
dh =  
    6.07083482564563  
rdh_sum =  
    51.0310114559721  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 70  
dh =  
    6.06392782564563  
rdh_sum =  
    51.658270509329  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 71  
dh =  
    6.05702082564563  
rdh_sum =  
    52.2845224178473  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 72  
dh =  
    6.05011382564563  
rdh_sum =  
    52.9097666340949  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 73  
dh =  
    6.02736132564563  
rdh_sum =  
    53.5316875718993  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 74  
dh =  
    5.98876332564563  
rdh_sum =  
    54.1479577667726
```

```
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 75  
dh =  
    5.95016532564563  
rdh_sum =  
    54.7585614750199  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 76  
dh =  
    5.91156732564563  
rdh_sum =  
    55.3634837202232  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 77  
dh =  
    5.87296932564563  
rdh_sum =  
    55.9627102952693  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 78  
dh =  
    5.83437082564563  
rdh_sum =  
    56.5562276902341  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 79  
dh =  
    5.79577232564563  
rdh_sum =  
    57.1440232419627  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 80  
dh =  
    5.75717432564563  
rdh_sum =  
    57.7260851364406  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 81  
dh =  
    5.72696382564563  
rdh_sum =  
    58.3036515289516  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 82  
dh =  
    5.71352882564563  
rdh_sum =  
    58.8792166244575  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 83  
dh =  
    5.70848182564563  
rdh_sum =  
    59.4540295894656  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 84  
dh =  
    5.70343432564563  
rdh_sum =  
    60.0280901762341  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 85  
dh =  
    5.69838682564563  
rdh_sum =  
    60.6013982132672  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 86  
dh =  
    5.69333932564563  
rdh_sum =  
    61.1739535308118  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 87  
dh =  
    5.68829182564563  
rdh_sum =  
    61.7457559608578  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 88  
dh =  
    5.67847732564563  
rdh_sum =  
    62.316093981034  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 89  
dh =  
    5.66389582564563  
rdh_sum =  
    62.8842551796871
```

```
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 90  
dh =  
    5.64931432564563  
rdh_sum =  
    63.4502382396087  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 91  
dh =  
    5.63473282564563  
rdh_sum =  
    64.0140418856828  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 92  
dh =  
    5.62015132564563  
rdh_sum =  
    64.5756648849101  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 93  
dh =  
    5.60556982564563  
rdh_sum =  
    65.1351060464325  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 94  
dh =  
    5.59098832564563  
rdh_sum =  
    65.6923642215553  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 95  
dh =  
    5.57640682564563  
rdh_sum =  
    66.2474383037701  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 96  
dh =  
    5.56182532564563  
rdh_sum =  
    66.8003272287756  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 97  
dh =  
    5.53716532564563  
rdh_sum =  
    67.349518347071  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 98  
dh =  
    5.50242732564563  
rdh_sum =  
    67.8934958810016  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 99  
dh =  
    5.46768882564563  
rdh_sum =  
    68.4322549320602  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 100  
dh =  
    5.43295032564563  
rdh_sum =  
    68.9657912491122  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 101  
dh =  
    5.39821232564563  
rdh_sum =  
    69.4941012291069  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 102  
dh =  
    5.36347382564563  
rdh_sum =  
    70.0171816917753  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 103  
dh =  
    5.32873532564563  
rdh_sum =  
    70.5350301056271  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 104  
dh =  
    5.29399732564563  
rdh_sum =  
    71.047644588375
```

```
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 105  
dh =  
    5.25974132564563  
rdh_sum =  
    71.5550964048885  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 106  
dh =  
    5.22645032564563  
rdh_sum =  
    72.0575302222905  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 107  
dh =  
    5.19364232564563  
rdh_sum =  
    72.5550186016048  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 108  
dh =  
    5.16083382564563  
rdh_sum =  
    73.0475617131806  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 109  
dh =  
    5.12802532564563  
rdh_sum =  
    73.5351602865434  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 110  
dh =  
    5.11708932564563  
rdh_sum =  
    74.0211109513435  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 111  
dh =  
    5.14989782564563  
rdh_sum =  
    74.5120058036855  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 112  
dh =  
    5.20457832564563  
rdh_sum =  
    75.011142658953  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 113  
dh =  
    5.21512382564563  
rdh_sum =  
    75.5118691358874  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 117  
dh =  
    4.84505282564563  
rdh_sum =  
    75.9569225315907  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 118  
dh =  
    4.86965932564563  
rdh_sum =  
    76.4056641094895  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 119  
dh =  
    4.89426532564563  
rdh_sum =  
    76.8580966153833  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 120  
dh =  
    4.91887182564563  
rdh_sum =  
    77.3142227419547  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 124  
dh =  
    4.63179832564563  
rdh_sum =  
    77.7274605031275  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 125  
dh =  
    4.62359632564563  
rdh_sum =  
    78.1394809224232
```

```
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 126  
dh =  
    4.61539432564563  
rdh_sum =  
    78.5502845377831  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 127  
dh =  
    4.60719232564563  
rdh_sum =  
    78.9598718945882  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 140  
dh =  
    3.25794682564563  
rdh_sum =  
    79.182275633657  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 141  
dh =  
    3.19232982564563  
rdh_sum =  
    79.3965076068413  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 142  
dh =  
    3.12671282564563  
rdh_sum =  
    79.6026796409093  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 143  
dh =  
    3.06109582564563  
rdh_sum =  
    79.8009067166457  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 144  
dh =  
    2.99547932564563  
rdh_sum =  
    79.9913069830396  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 145  
dh =  
    2.92986282564563  
rdh_sum =  
    80.1740015908386  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 146  
dh =  
    2.86424582564563  
rdh_sum =  
    80.349114648833  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 147  
dh =  
    2.79862882564563  
rdh_sum =  
    80.5167732918083  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 148  
dh =  
    2.76910132564563  
rdh_sum =  
    80.6811197215741  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 149  
dh =  
    2.77566282564563  
rdh_sum =  
    80.8461998906477  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 150  
dh =  
    2.78222432564563  
rdh_sum =  
    81.0120151096002  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 151  
dh =  
    2.78878632564563  
rdh_sum =  
    81.1785667422881  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 152  
dh =  
    2.79534832564563  
rdh_sum =  
    81.3458560937231
```

```
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 155  
dh =  
    2.43177132564563  
rdh_sum =  
    81.47431353211  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 156  
dh =  
    2.41984082564563  
rdh_sum =  
    81.6015698950754  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 157  
dh =  
    2.40791032564563  
rdh_sum =  
    81.7276300047683  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 158  
dh =  
    2.39598032564563  
rdh_sum =  
    81.8524987486434  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 159  
dh =  
    2.38404982564563  
rdh_sum =  
    81.976180929705  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 160  
dh =  
    2.36598832564563  
rdh_sum =  
    82.0980760506278  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 161  
dh =  
    2.33566582564563  
rdh_sum =  
    82.216996206662  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 162  
dh =  
    2.29921232564563  
rdh_sum =  
    82.3323820581369  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 163  
dh =  
    2.26275832564563  
rdh_sum =  
    82.4442800104416  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 164  
dh =  
    2.22630432564563  
rdh_sum =  
    82.5527369390318  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 165  
dh =  
    2.18464282564563  
rdh_sum =  
    82.6573192202618  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 166  
dh =  
    2.13777382564563  
rdh_sum =  
    82.7576171318566  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 167  
dh =  
    2.09090482564563  
rdh_sum =  
    82.8537104758807  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 168  
dh =  
    2.06710982564563  
rdh_sum =  
    82.9477000071846  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 169  
dh =  
    2.08946282564563  
rdh_sum =  
    83.0436652653811
```

```
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 170
dh =
    2.13488982564563
rdh_sum =
    83.1437021436228
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 171
dh =
    2.18031682564563
rdh_sum =
    83.2478856580707
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 172
dh =
    2.22574382564563
rdh_sum =
    83.3562900471524
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 173
dh =
    2.27117082564563
rdh_sum =
    83.4689887576381
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 174
dh =
    2.31659782564563
rdh_sum =
    83.5860544308647
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 175
dh =
    2.32700832564563
rdh_sum =
    83.7041310260816
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 176
dh =
    2.30240182564563
rdh_sum =
    83.819824263379
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 177
dh =
    2.27779532564563
rdh_sum =
    83.9331552917301
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 178
dh =
    2.25318932564563
rdh_sum =
    84.0441454374541
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 180
dh =
    2.11621432564563
rdh_sum =
    84.1424993069838
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 181
dh =
    2.19495432564563
rdh_sum =
    84.2480348039705
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 182
dh =
    2.23760532564563
rdh_sum =
    84.3575534359086
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 183
dh =
    2.20807782564563
rdh_sum =
    84.4643076075868
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 184
dh =
    2.14246082564563
rdh_sum =
    84.5650303881152
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 185
dh =
    2.07684382564563
rdh_sum =
    84.6598780226891
```



```
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 186
dh =
    2.01122732564563
rdh_sum =
    84.7490090985171
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 187
dh =
    1.94561082564563
rdh_sum =
    84.8325843944113
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 188
dh =
    1.88655532564563
rdh_sum =
    84.9112986996486
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 189
dh =
    1.83406182564563
rdh_sum =
    84.9858042039234
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 190
dh =
    1.78156832564563
rdh_sum =
    85.0562074709875
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 191
dh =
    1.72907482564563
rdh_sum =
    85.1226160919853
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 192
dh =
    1.67658182564563
rdh_sum =
    85.1851386950022
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 193
dh =
    1.64377332564563
rdh_sum =
    85.2452880865953
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 194
dh =
    1.63064982564563
rdh_sum =
    85.3045002225038
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 195
dh =
    1.61752632564563
rdh_sum =
    85.3627820026147
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 196
dh =
    1.60440282564563
rdh_sum =
    85.4201403413781
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 197
dh =
    1.59127982564563
rdh_sum =
    85.4765822024862
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 198
dh =
    1.56917732564563
rdh_sum =
    85.5314961812989
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 199
dh =
    1.53809532564563
rdh_sum =
    85.5842950025976
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 200
dh =
    1.50701382564563
rdh_sum =
    85.6350179667766
```

```
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 201  
dh =  
    1.47593232564563  
rdh_sum =  
    85.6837045221589  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 202  
dh =  
    1.44485082564563  
rdh_sum =  
    85.7303942958719  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 203  
dh =  
    1.41376932564563  
rdh_sum =  
    85.7751270903689  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 204  
dh =  
    1.38268732564563  
rdh_sum =  
    85.8179428494174  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 205  
dh =  
    1.35160582564563  
rdh_sum =  
    85.858881746785  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 206  
dh =  
    1.32052432564563  
rdh_sum =  
    85.8979840898746  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 207  
dh =  
    1.27938232564563  
rdh_sum =  
    85.9347176837212  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 230  
dh =  
    -2.22269667435437  
rdh_sum =  
    85.9837855061443  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 231  
dh =  
    -2.16036067435437  
rdh_sum =  
    86.0301824792242  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 232  
dh =  
    -2.09802467435437  
rdh_sum =  
    86.0739798028252  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 233  
dh =  
    -2.03568867435437  
rdh_sum =  
    86.1152490848663  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 234  
dh =  
    -1.97335267435437  
rdh_sum =  
    86.1540623300808  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 235  
dh =  
    -1.91101667435437  
rdh_sum =  
    86.1904919287141  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 236  
dh =  
    -1.84868067435437  
rdh_sum =  
    86.2246106451611  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 237  
dh =  
    -1.78634467435437  
rdh_sum =  
    86.2564916065446
```

```
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 238  
dh =  
    -1.72400867435437  
rdh_sum =  
    86.286208291237  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 239  
dh =  
    -1.66167267435437  
rdh_sum =  
    86.3138345173268  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 240  
dh =  
    -1.62359767435437  
rdh_sum =  
    86.3402203406954  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 241  
dh =  
    -1.60978367435437  
rdh_sum =  
    86.3661629862386  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 242  
dh =  
    -1.59596967435437  
rdh_sum =  
    86.3916661082255  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 243  
dh =  
    -1.58215567435437  
rdh_sum =  
    86.4167333643137  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 244  
dh =  
    -1.56834167435437  
rdh_sum =  
    86.4413684155204  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 245  
dh =  
    -1.55452767435437  
rdh_sum =  
    86.4655749261945  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 246  
dh =  
    -1.54071367435437  
rdh_sum =  
    86.4893565639885  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 247  
dh =  
    -1.52689967435437  
rdh_sum =  
    86.5127169998297  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 248  
dh =  
    -1.51308567435437  
rdh_sum =  
    86.5356599078924  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 249  
dh =  
    -1.49543417435437  
rdh_sum =  
    86.5580746519191  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 250  
dh =  
    -1.47010817435437  
rdh_sum =  
    86.5797420982635  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 251  
dh =  
    -1.44094517435437  
rdh_sum =  
    86.6005643814635  
ans =  
Berm Factor Calculation: Iteration 1, Profile Segment: 252  
dh =  
    -1.41178217435437  
rdh_sum =  
    86.6205579638301
```

```

ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 253
dh =
    -1.38261917435437
rdh_sum =
    86.6397393361451
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 254
dh =
    -1.35345617435437
rdh_sum =
    86.6581250170936
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 255
dh =
    -1.32429317435437
rdh_sum =
    86.6757315526972
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 256
dh =
    -1.29513017435437
rdh_sum =
    86.6925755157452
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 257
dh =
    -1.26596717435437
rdh_sum =
    86.7086735052255
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 258
dh =
    -1.23680417435437
rdh_sum =
    86.724042145754
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 259
dh =
    -1.20764117435437
rdh_sum =
    86.7386980870036
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 260
dh =
    -1.17847817435437
rdh_sum =
    86.7526580031323
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 261
dh =
    -1.14931517435437
rdh_sum =
    86.7659385922104
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 262
dh =
    -1.12015217435437
rdh_sum =
    86.7785565756465
ans =
!----- End Berm Factor Calculation, Iter: 1 -----!
berm_width =
    219
rB =
    0.599422310485056
rdh_mean =
    0.396249116783774
gamma_berm =
    0.638098250625137
slope =
    0.160644629661688
Irb =
    1.99549337517634
gamma_berm =
    0.638098250625137
gamma_perm =
    1
gamma_beta =
    1
gamma_rough =
    0.6
gamma =
    0.382858950375082
ans =
!!! - - Iribaren number: 1.27 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:6.2 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
    7.04571530897157

```

```

!   Berm_width is greater than 1/4 wave length
!   Runup will be weighted average with foreshore calculation assuming depth limited wave height on berm
fore_H0 =
    6.63775593
upper_slope =
    0.1429499999999999
upper_slope =
    0.142950011159322
upper_slope =
    0.142950022072332
upper_slope =
    0.142950032747096
upper_slope =
    0.142950043191332
upper_slope =
    0.142950053412426
upper_slope =
    0.142950063417456
upper_slope =
    0.142950073213199
upper_slope =
    0.142950072455386
upper_slope =
    0.142950081957829
upper_slope =
    0.142950091267547
upper_slope =
    0.142950100390343
upper_slope =
    0.142950109331792
upper_slope =
    0.142950118097247
w2 =
    0.0298717885582036
w1 =
    0.970128211441796
R2_new =
    7.16652805111859
R2del =
    8.46437194888141
Z2 =
    16.4349733767642
ans =
!----- STARTING ITERATION 2 -----!
Ztoe =
    1.38872
toe_sta =
    51.2594075418113
top_sta =
    357.399058249488
Z2 =
    16.4349733767642
H0 =
    5.2103
Tp =
    13.7882
T0 =
    12.5347272727273
R2 =
    7.16652805111859
Z2 =
    16.4349733767642
top_sta =
    357.399058249488
Lslope =
    306.139650707676
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 1
dh =
    7.76611882564563
rdh_sum =
    1
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 2
dh =
    7.71541532564563
rdh_sum =
    2
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 3
dh =
    7.66471132564563
rdh_sum =
    3
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 4
dh =
    7.61400732564563
rdh_sum =
    4

```

```
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 5
dh =
    7.58592132564563
rdh_sum =
    5
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 6
dh =
    7.58045332564563
rdh_sum =
    6
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 7
dh =
    7.57498532564563
rdh_sum =
    7
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 8
dh =
    7.56951732564563
rdh_sum =
    8
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 9
dh =
    7.56404932564563
rdh_sum =
    9
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 10
dh =
    7.55858132564563
rdh_sum =
    10
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 11
dh =
    7.55311282564563
rdh_sum =
    11
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 12
dh =
    7.54764432564563
rdh_sum =
    12
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 13
dh =
    7.54217632564563
rdh_sum =
    13
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 14
dh =
    7.53670832564563
rdh_sum =
    14
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 15
dh =
    7.53124032564563
rdh_sum =
    15
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 16
dh =
    7.52577232564563
rdh_sum =
    16
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 17
dh =
    7.49679182564563
rdh_sum =
    17
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 18
dh =
    7.44429832564563
rdh_sum =
    18
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 19
dh =
    7.39180482564563
rdh_sum =
    19
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 20  
dh =  
    7.33931132564563  
rdh_sum =  
    20  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 21  
dh =  
    7.28681782564563  
rdh_sum =  
    21  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 22  
dh =  
    7.23432432564563  
rdh_sum =  
    22  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 23  
dh =  
    7.18183082564563  
rdh_sum =  
    23  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 24  
dh =  
    7.12933782564563  
rdh_sum =  
    23.7734043648044  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 25  
dh =  
    7.07684432564563  
rdh_sum =  
    24.5401496855077  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 26  
dh =  
    7.02435082564563  
rdh_sum =  
    25.3001691565871  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 27  
dh =  
    6.98947032564563  
rdh_sum =  
    26.0556833672126  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 28  
dh =  
    6.97220282564563  
rdh_sum =  
    26.8089567734112  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 29  
dh =  
    6.95493532564563  
rdh_sum =  
    27.5599825114384  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 30  
dh =  
    6.93766732564563  
rdh_sum =  
    28.3087537130835  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 31  
dh =  
    6.92039982564563  
rdh_sum =  
    29.055263701795  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 32  
dh =  
    6.90313232564563  
rdh_sum =  
    29.7995057971181  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 33  
dh =  
    6.88586482564563  
rdh_sum =  
    30.5414733800581  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 34  
dh =  
    6.86859732564563  
rdh_sum =  
    31.2811598932601
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 35  
dh =  
    6.85132982564563  
rdh_sum =  
    32.0185588411864  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 36  
dh =  
    6.83492582564563  
rdh_sum =  
    32.7537786586985  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 37  
dh =  
    6.82024832564563  
rdh_sum =  
    33.4870438183676  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 38  
dh =  
    6.80643432564563  
rdh_sum =  
    34.2184651428248  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 39  
dh =  
    6.79261982564563  
rdh_sum =  
    34.9480385513193  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 40  
dh =  
    6.77880532564563  
rdh_sum =  
    35.6757600618182  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 41  
dh =  
    6.76499132564563  
rdh_sum =  
    36.4016257916515  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 42  
dh =  
    6.75117732564563  
rdh_sum =  
    37.125631823381  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 43  
dh =  
    6.73736332564563  
rdh_sum =  
    37.847774271823  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 44  
dh =  
    6.72354932564563  
rdh_sum =  
    38.5680492841161  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 45  
dh =  
    6.70973532564563  
rdh_sum =  
    39.2864530397878  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 46  
dh =  
    6.68095632564563  
rdh_sum =  
    40.0009462382045  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 47  
dh =  
    6.63721182564563  
rdh_sum =  
    40.709464506541  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 48  
dh =  
    6.59346732564563  
rdh_sum =  
    41.4119715789115  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 49  
dh =  
    6.54972282564563  
rdh_sum =  
    42.1084322349088
```



```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 50  
dh =  
    6.50597782564563  
rdh_sum =  
    42.7988122360369  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 51  
dh =  
    6.46223332564563  
rdh_sum =  
    43.4830785403593  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 52  
dh =  
    6.41848882564563  
rdh_sum =  
    44.1611990999369  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 53  
dh =  
    6.38239932564563  
rdh_sum =  
    44.8342260109095  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 54  
dh =  
    6.36162082564563  
rdh_sum =  
    45.5043109278275  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 55  
dh =  
    6.34849782564563  
rdh_sum =  
    46.1725343344364  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 56  
dh =  
    6.33537432564563  
rdh_sum =  
    46.8388935265708  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 57  
dh =  
    6.32225082564563  
rdh_sum =  
    47.5033859001218  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 58  
dh =  
    6.30256582564563  
rdh_sum =  
    48.1650732626883  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 59  
dh =  
    6.26975732564563  
rdh_sum =  
    48.8220729774218  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 60  
dh =  
    6.23038732564563  
rdh_sum =  
    49.4734273092001  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 61  
dh =  
    6.19101732564563  
rdh_sum =  
    50.1191149357184  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 62  
dh =  
    6.15164732564563  
rdh_sum =  
    50.7591153329789  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 63  
dh =  
    6.12039282564563  
rdh_sum =  
    51.3945867501306  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 64  
dh =  
    6.10536982564563  
rdh_sum =  
    52.0278769320606
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 65  
dh =  
    6.09846282564563  
rdh_sum =  
    52.6601633453675  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 66  
dh =  
    6.09155582564563  
rdh_sum =  
    53.2914454164534  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 67  
dh =  
    6.08464882564563  
rdh_sum =  
    53.9217225760753  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 68  
dh =  
    6.07774182564563  
rdh_sum =  
    54.5509942593473  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 69  
dh =  
    6.07083482564563  
rdh_sum =  
    55.1792599057436  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 70  
dh =  
    6.06392782564563  
rdh_sum =  
    55.8065189591005  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 71  
dh =  
    6.05702082564563  
rdh_sum =  
    56.4327708676188  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 72  
dh =  
    6.05011382564563  
rdh_sum =  
    57.0580150838663  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 73  
dh =  
    6.02736132564563  
rdh_sum =  
    57.6799360216708  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 74  
dh =  
    5.98876332564563  
rdh_sum =  
    58.2962062165441  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 75  
dh =  
    5.95016532564563  
rdh_sum =  
    58.9068099247914  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 76  
dh =  
    5.91156732564563  
rdh_sum =  
    59.5117321699947  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 77  
dh =  
    5.87296932564563  
rdh_sum =  
    60.1109587450408  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 78  
dh =  
    5.83437082564563  
rdh_sum =  
    60.7044761400056  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 79  
dh =  
    5.79577232564563  
rdh_sum =  
    61.2922716917342
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 80  
dh =  
    5.75717432564563  
rdh_sum =  
    61.8743335862121  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 81  
dh =  
    5.72696382564563  
rdh_sum =  
    62.4518999787231  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 82  
dh =  
    5.71352882564563  
rdh_sum =  
    63.027465074229  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 83  
dh =  
    5.70848182564563  
rdh_sum =  
    63.6022780392371  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 84  
dh =  
    5.70343432564563  
rdh_sum =  
    64.1763386260056  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 85  
dh =  
    5.69838682564563  
rdh_sum =  
    64.7496466630387  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 86  
dh =  
    5.69333932564563  
rdh_sum =  
    65.3222019805833  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 87  
dh =  
    5.68829182564563  
rdh_sum =  
    65.8940044106293  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 88  
dh =  
    5.67847732564563  
rdh_sum =  
    66.4643424308055  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 89  
dh =  
    5.66389582564563  
rdh_sum =  
    67.0325036294586  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 90  
dh =  
    5.64931432564563  
rdh_sum =  
    67.5984866893802  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 91  
dh =  
    5.63473282564563  
rdh_sum =  
    68.1622903354543  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 92  
dh =  
    5.62015132564563  
rdh_sum =  
    68.7239133346816  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 93  
dh =  
    5.60556982564563  
rdh_sum =  
    69.283354496204  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 94  
dh =  
    5.59098832564563  
rdh_sum =  
    69.8406126713268
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 95  
dh =  
    5.57640682564563  
rdh_sum =  
    70.3956867535416  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 96  
dh =  
    5.56182532564563  
rdh_sum =  
    70.9485756785471  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 97  
dh =  
    5.53716532564563  
rdh_sum =  
    71.4977667968424  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 98  
dh =  
    5.50242732564563  
rdh_sum =  
    72.0417443307731  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 99  
dh =  
    5.46768882564563  
rdh_sum =  
    72.5805033818317  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 100  
dh =  
    5.43295032564563  
rdh_sum =  
    73.1140396988837  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 101  
dh =  
    5.39821232564563  
rdh_sum =  
    73.6423496788784  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 102  
dh =  
    5.36347382564563  
rdh_sum =  
    74.1654301415468  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 103  
dh =  
    5.32873532564563  
rdh_sum =  
    74.6832785553986  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 104  
dh =  
    5.29399732564563  
rdh_sum =  
    75.1958930381465  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 105  
dh =  
    5.25974132564563  
rdh_sum =  
    75.70334485466  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 106  
dh =  
    5.22645032564563  
rdh_sum =  
    76.2057786720619  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 107  
dh =  
    5.19364232564563  
rdh_sum =  
    76.7032670513763  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 108  
dh =  
    5.16083382564563  
rdh_sum =  
    77.1958101629521  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 109  
dh =  
    5.12802532564563  
rdh_sum =  
    77.6834087363148
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 110  
dh =  
    5.11708932564563  
rdh_sum =  
    78.169359401115  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 111  
dh =  
    5.14989782564563  
rdh_sum =  
    78.660254253457  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 112  
dh =  
    5.20457832564563  
rdh_sum =  
    79.1593911087245  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 113  
dh =  
    5.21512382564563  
rdh_sum =  
    79.6601175856588  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 117  
dh =  
    4.84505282564563  
rdh_sum =  
    80.1051709813622  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 118  
dh =  
    4.86965932564563  
rdh_sum =  
    80.553912559261  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 119  
dh =  
    4.89426532564563  
rdh_sum =  
    81.0063450651548  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 120  
dh =  
    4.91887182564563  
rdh_sum =  
    81.4624711917262  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 124  
dh =  
    4.63179832564563  
rdh_sum =  
    81.875708952899  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 125  
dh =  
    4.62359632564563  
rdh_sum =  
    82.2877293721947  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 126  
dh =  
    4.61539432564563  
rdh_sum =  
    82.6985329875546  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 127  
dh =  
    4.60719232564563  
rdh_sum =  
    83.1081203443597  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 140  
dh =  
    3.25794682564563  
rdh_sum =  
    83.3305240834285  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 141  
dh =  
    3.19232982564563  
rdh_sum =  
    83.5447560566128  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 142  
dh =  
    3.12671282564563  
rdh_sum =  
    83.7509280906808
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 143  
dh =  
    3.06109582564563  
rdh_sum =  
    83.9491551664172  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 144  
dh =  
    2.99547932564563  
rdh_sum =  
    84.1395554328111  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 145  
dh =  
    2.92986282564563  
rdh_sum =  
    84.3222500406101  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 146  
dh =  
    2.86424582564563  
rdh_sum =  
    84.4973630986045  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 147  
dh =  
    2.79862882564563  
rdh_sum =  
    84.6650217415798  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 148  
dh =  
    2.76910132564563  
rdh_sum =  
    84.8293681713456  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 149  
dh =  
    2.77566282564563  
rdh_sum =  
    84.9944483404192  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 150  
dh =  
    2.78222432564563  
rdh_sum =  
    85.1602635593717  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 151  
dh =  
    2.78878632564563  
rdh_sum =  
    85.3268151920595  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 152  
dh =  
    2.79534832564563  
rdh_sum =  
    85.4941045434945  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 155  
dh =  
    2.43177132564563  
rdh_sum =  
    85.6225619818814  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 156  
dh =  
    2.41984082564563  
rdh_sum =  
    85.7498183448469  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 157  
dh =  
    2.40791032564563  
rdh_sum =  
    85.8758784545398  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 158  
dh =  
    2.39598032564563  
rdh_sum =  
    86.0007471984149  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 159  
dh =  
    2.38404982564563  
rdh_sum =  
    86.1244293794765
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 160  
dh =  
    2.36598832564563  
rdh_sum =  
    86.2463245003993  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 161  
dh =  
    2.33566582564563  
rdh_sum =  
    86.3652446564335  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 162  
dh =  
    2.29921232564563  
rdh_sum =  
    86.4806305079084  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 163  
dh =  
    2.26275832564563  
rdh_sum =  
    86.5925284602131  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 164  
dh =  
    2.22630432564563  
rdh_sum =  
    86.7009853888033  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 165  
dh =  
    2.18464282564563  
rdh_sum =  
    86.8055676700333  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 166  
dh =  
    2.13777382564563  
rdh_sum =  
    86.9058655816281  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 167  
dh =  
    2.09090482564563  
rdh_sum =  
    87.0019589256522  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 168  
dh =  
    2.06710982564563  
rdh_sum =  
    87.0959484569561  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 169  
dh =  
    2.08946282564563  
rdh_sum =  
    87.1919137151526  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 170  
dh =  
    2.13488982564563  
rdh_sum =  
    87.2919505933943  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 171  
dh =  
    2.18031682564563  
rdh_sum =  
    87.3961341078422  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 172  
dh =  
    2.22574382564563  
rdh_sum =  
    87.5045384969239  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 173  
dh =  
    2.27117082564563  
rdh_sum =  
    87.6172372074096  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 174  
dh =  
    2.31659782564563  
rdh_sum =  
    87.7343028806362
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 175  
dh =  
    2.32700832564563  
rdh_sum =  
    87.8523794758531  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 176  
dh =  
    2.30240182564563  
rdh_sum =  
    87.9680727131505  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 177  
dh =  
    2.27779532564563  
rdh_sum =  
    88.0814037415016  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 178  
dh =  
    2.25318932564563  
rdh_sum =  
    88.1923938872256  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 180  
dh =  
    2.11621432564563  
rdh_sum =  
    88.2907477567553  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 181  
dh =  
    2.19495432564563  
rdh_sum =  
    88.396283253742  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 182  
dh =  
    2.23760532564563  
rdh_sum =  
    88.5058018856801  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 183  
dh =  
    2.20807782564563  
rdh_sum =  
    88.6125560573583  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 184  
dh =  
    2.14246082564563  
rdh_sum =  
    88.7132788378867  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 185  
dh =  
    2.07684382564563  
rdh_sum =  
    88.8081264724606  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 186  
dh =  
    2.01122732564563  
rdh_sum =  
    88.8972575482886  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 187  
dh =  
    1.94561082564563  
rdh_sum =  
    88.9808328441828  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 188  
dh =  
    1.88655532564563  
rdh_sum =  
    89.0595471494201  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 189  
dh =  
    1.83406182564563  
rdh_sum =  
    89.1340526536949  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 190  
dh =  
    1.78156832564563  
rdh_sum =  
    89.204455920759
```



```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 191  
dh =  
    1.72907482564563  
rdh_sum =  
    89.2708645417568  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 192  
dh =  
    1.67658182564563  
rdh_sum =  
    89.3333871447736  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 193  
dh =  
    1.64377332564563  
rdh_sum =  
    89.3935365363668  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 194  
dh =  
    1.63064982564563  
rdh_sum =  
    89.4527486722753  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 195  
dh =  
    1.61752632564563  
rdh_sum =  
    89.5110304523861  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 196  
dh =  
    1.60440282564563  
rdh_sum =  
    89.5683887911496  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 197  
dh =  
    1.59127982564563  
rdh_sum =  
    89.6248306522577  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 198  
dh =  
    1.56917732564563  
rdh_sum =  
    89.6797446310704  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 199  
dh =  
    1.53809532564563  
rdh_sum =  
    89.732543452369  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 200  
dh =  
    1.50701382564563  
rdh_sum =  
    89.7832664165481  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 201  
dh =  
    1.47593232564563  
rdh_sum =  
    89.8319529719303  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 202  
dh =  
    1.44485082564563  
rdh_sum =  
    89.8786427456434  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 203  
dh =  
    1.41376932564563  
rdh_sum =  
    89.9233755401404  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 204  
dh =  
    1.38268732564563  
rdh_sum =  
    89.9661912991889  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 205  
dh =  
    1.35160582564563  
rdh_sum =  
    90.0071301965565
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 206  
dh =  
    1.32052432564563  
rdh_sum =  
    90.0462325396461  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 207  
dh =  
    1.27938232564563  
rdh_sum =  
    90.0829661334927  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 230  
dh =  
    -2.22269667435437  
rdh_sum =  
    90.3021186487666  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 231  
dh =  
    -2.16036067435437  
rdh_sum =  
    90.5100733224362  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 232  
dh =  
    -2.09802467435437  
rdh_sum =  
    90.7070482177608  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 233  
dh =  
    -2.03568867435437  
rdh_sum =  
    90.8932695963373  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 234  
dh =  
    -1.97335267435437  
rdh_sum =  
    91.0689717491566  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 235  
dh =  
    -1.91101667435437  
rdh_sum =  
    91.2343968216635  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 236  
dh =  
    -1.84868067435437  
rdh_sum =  
    91.389794632953  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 237  
dh =  
    -1.78634467435437  
rdh_sum =  
    91.5354224892364  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 238  
dh =  
    -1.72400867435437  
rdh_sum =  
    91.6715449917164  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 239  
dh =  
    -1.66167267435437  
rdh_sum =  
    91.798433839016  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 240  
dh =  
    -1.62359767435437  
rdh_sum =  
    91.9198193644708  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 241  
dh =  
    -1.60978367435437  
rdh_sum =  
    92.0392342243335  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 242  
dh =  
    -1.59596967435437  
rdh_sum =  
    92.1566923749204
```

```
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 243  
dh =  
    -1.58215567435437  
rdh_sum =  
    92.2722078443018  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 244  
dh =  
    -1.56834167435437  
rdh_sum =  
    92.3857947317873  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 245  
dh =  
    -1.55452767435437  
rdh_sum =  
    92.497467207409  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 246  
dh =  
    -1.54071367435437  
rdh_sum =  
    92.6072395114018  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 247  
dh =  
    -1.52689967435437  
rdh_sum =  
    92.715125953681  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 248  
dh =  
    -1.51308567435437  
rdh_sum =  
    92.8211409133179  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 249  
dh =  
    -1.49543417435437  
rdh_sum =  
    92.9247855310674  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 250  
dh =  
    -1.47010817435437  
rdh_sum =  
    93.0250707195188  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 251  
dh =  
    -1.44094517435437  
rdh_sum =  
    93.1215485652906  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 252  
dh =  
    -1.41178217435437  
rdh_sum =  
    93.2142850172389  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 253  
dh =  
    -1.38261917435437  
rdh_sum =  
    93.3033466356868  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 254  
dh =  
    -1.35345617435437  
rdh_sum =  
    93.388800581547  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 255  
dh =  
    -1.32429317435437  
rdh_sum =  
    93.4707146053449  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 256  
dh =  
    -1.29513017435437  
rdh_sum =  
    93.5491570361462  
ans =  
Berm Factor Calculation: Iteration 2, Profile Segment: 257  
dh =  
    -1.26596717435437  
rdh_sum =  
    93.6241967703897
```

```

ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 258
dh =
    -1.23680417435437
rdh_sum =
    93.6959032606272
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 259
dh =
    -1.20764117435437
rdh_sum =
    93.7643465041727
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 260
dh =
    -1.17847817435437
rdh_sum =
    93.8295970316627
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 261
dh =
    -1.14931517435437
rdh_sum =
    93.8917258955289
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 262
dh =
    -1.12015217435437
rdh_sum =
    93.950804658386
ans =
!----- End Berm Factor Calculation, Iter: 2 -----!
berm_width =
    219
rB =
    0.715359802278982
rdh_mean =
    0.42899910802916
gamma_berm =
    0.591528914818617
gamma_berm =
    0.6
slope =
    0.17266827735217
Irb =
    2.14484856596198
gamma_berm =
    0.6
gamma_perm =
    1
gamma_beta =
    1
gamma_rough =
    0.6
gamma =
    0.36
ans =
!!! - - Iribaren number: 1.29 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:5.8 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
    7.12090401671524
! Berm_width is greater than 1/4 wave length
! Runup will be weighted average with foreshore calculation assuming depth limited wave height on berm
fore_H0 =
    6.63775593
upper_slope =
    0.142949999999999
upper_slope =
    0.142950032895755
upper_slope =
    0.142950063696177
upper_slope =
    0.142950092595283
upper_slope =
    0.142950119763855
upper_slope =
    0.142950145352816
upper_slope =
    0.142950169496034
upper_slope =
    0.142950192312667
upper_slope =
    0.142950187170488
upper_slope =
    0.142950208338442
upper_slope =
    0.142950228431855
upper_slope =
    0.142950247530522

```

```

upper_slope =
    0.142950265706527
upper_slope =
    0.142950283025154
w2 =
    0.0298717885582036
w1 =
    0.970128211441796
R2_new =
    7.23947111989603
R2del =
    0.0729430687774446
Z2 =
    16.5079164455417
ans =
!----- STARTING ITERATION 3 -----!
Ztoe =
    1.38872
toe_sta =
    51.2594075418113
top_sta =
    357.909328055556
Z2 =
    16.5079164455417
H0 =
    5.2103
Tp =
    13.7882
T0 =
    12.5347272727273
R2 =
    7.23947111989603
Z2 =
    16.5079164455417
top_sta =
    357.909328055556
Lslope =
    306.649920513744
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 1
dh =
    7.76611882564563
rdh_sum =
    1
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 2
dh =
    7.71541532564563
rdh_sum =
    2
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 3
dh =
    7.66471132564563
rdh_sum =
    3
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 4
dh =
    7.61400732564563
rdh_sum =
    4
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 5
dh =
    7.58592132564563
rdh_sum =
    5
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 6
dh =
    7.58045332564563
rdh_sum =
    6
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 7
dh =
    7.57498532564563
rdh_sum =
    7
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 8
dh =
    7.56951732564563
rdh_sum =
    8
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 9
dh =
    7.56404932564563

```

```
rdh_sum =
9
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 10
dh =
7.55858132564563
rdh_sum =
10
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 11
dh =
7.55311282564563
rdh_sum =
11
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 12
dh =
7.54764432564563
rdh_sum =
12
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 13
dh =
7.54217632564563
rdh_sum =
13
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 14
dh =
7.53670832564563
rdh_sum =
14
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 15
dh =
7.53124032564563
rdh_sum =
15
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 16
dh =
7.52577232564563
rdh_sum =
16
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 17
dh =
7.49679182564563
rdh_sum =
17
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 18
dh =
7.44429832564563
rdh_sum =
18
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 19
dh =
7.39180482564563
rdh_sum =
19
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 20
dh =
7.33931132564563
rdh_sum =
20
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 21
dh =
7.28681782564563
rdh_sum =
21
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 22
dh =
7.23432432564563
rdh_sum =
21.7865153208732
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 23
dh =
7.18183082564563
rdh_sum =
22.5665101940757
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 24
dh =
7.12933782564563
```

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rdh_sum =
    23.3399145588801
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 25
dh =
    7.07684432564563
rdh_sum =
    24.1066598795834
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 26
dh =
    7.02435082564563
rdh_sum =
    24.8666793506628
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 27
dh =
    6.98947032564563
rdh_sum =
    25.6221935612883
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 28
dh =
    6.97220282564563
rdh_sum =
    26.3754669674869
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 29
dh =
    6.95493532564563
rdh_sum =
    27.1264927055141
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 30
dh =
    6.93766732564563
rdh_sum =
    27.8752639071592
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 31
dh =
    6.92039982564563
rdh_sum =
    28.6217738958707
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 32
dh =
    6.90313232564563
rdh_sum =
    29.3660159911938
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 33
dh =
    6.88586482564563
rdh_sum =
    30.1079835741338
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 34
dh =
    6.86859732564563
rdh_sum =
    30.8476700873358
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 35
dh =
    6.85132982564563
rdh_sum =
    31.5850690352621
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 36
dh =
    6.83492582564563
rdh_sum =
    32.3202888527742
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 37
dh =
    6.82024832564563
rdh_sum =
    33.0535540124433
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 38
dh =
    6.80643432564563
rdh_sum =
    33.7849753369005
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 39
dh =
    6.79261982564563
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rdh_sum =
    34.514548745395
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 40
dh =
    6.77880532564563
rdh_sum =
    35.2422702558939
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 41
dh =
    6.76499132564563
rdh_sum =
    35.9681359857273
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 42
dh =
    6.75117732564563
rdh_sum =
    36.6921420174568
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 43
dh =
    6.73736332564563
rdh_sum =
    37.4142844658987
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 44
dh =
    6.72354932564563
rdh_sum =
    38.1345594781918
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 45
dh =
    6.70973532564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 46
dh =
    6.68095632564563
rdh_sum =
    39.5674564322802
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 47
dh =
    6.63721182564563
rdh_sum =
    40.2759747006167
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 48
dh =
    6.59346732564563
rdh_sum =
    40.9784817729873
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 49
dh =
    6.54972282564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 50
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 51
dh =
    6.46223332564563
rdh_sum =
    43.049588734435
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 52
dh =
    6.41848882564563
rdh_sum =
    43.7277092940126
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 53
dh =
    6.38239932564563
rdh_sum =
    44.4007362049852
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 54
dh =
    6.36162082564563
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rdh_sum =
    45.0708211219032
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 55
dh =
    6.34849782564563
rdh_sum =
    45.7390445285121
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 56
dh =
    6.33537432564563
rdh_sum =
    46.4054037206465
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 57
dh =
    6.32225082564563
rdh_sum =
    47.0698960941975
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 58
dh =
    6.30256582564563
rdh_sum =
    47.731583456764
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 59
dh =
    6.26975732564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 60
dh =
    6.23038732564563
rdh_sum =
    49.0399375032759
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 61
dh =
    6.19101732564563
rdh_sum =
    49.6856251297941
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 62
dh =
    6.15164732564563
rdh_sum =
    50.3256255270546
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 63
dh =
    6.12039282564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 64
dh =
    6.10536982564563
rdh_sum =
    51.5943871261363
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 65
dh =
    6.09846282564563
rdh_sum =
    52.2266735394432
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 66
dh =
    6.09155582564563
rdh_sum =
    52.8579556105291
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 67
dh =
    6.08464882564563
rdh_sum =
    53.488232770151
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 68
dh =
    6.07774182564563
rdh_sum =
    54.117504453423
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 69
dh =
    6.07083482564563
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 70
dh =
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rdh_sum =
    55.3730291531762
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 71
dh =
    6.05702082564563
rdh_sum =
    55.9992810616945
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 72
dh =
    6.05011382564563
rdh_sum =
    56.6245252779421
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 73
dh =
    6.02736132564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 74
dh =
    5.98876332564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 75
dh =
    5.95016532564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 76
dh =
    5.91156732564563
rdh_sum =
    59.0782423640704
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 77
dh =
    5.87296932564563
rdh_sum =
    59.6774689391165
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 78
dh =
    5.83437082564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 79
dh =
    5.79577232564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 80
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 81
dh =
    5.72696382564563
rdh_sum =
    62.0184101727988
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 82
dh =
    5.71352882564563
rdh_sum =
    62.5939752683047
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 83
dh =
    5.70848182564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 84
dh =
    5.70343432564563
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rdh_sum =
    63.7428488200813
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 85
dh =
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rdh_sum =
    64.3161568571144
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 86
dh =
    5.69333932564563
rdh_sum =
    64.888712174659
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 87
dh =
    5.68829182564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 88
dh =
    5.67847732564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 89
dh =
    5.66389582564563
rdh_sum =
    66.5990138235343
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 90
dh =
    5.64931432564563
rdh_sum =
    67.1649968834559
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 91
dh =
    5.63473282564563
rdh_sum =
    67.72880052953
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 92
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 93
dh =
    5.60556982564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 94
dh =
    5.59098832564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 95
dh =
    5.57640682564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 96
dh =
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rdh_sum =
    70.5150858726228
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 97
dh =
    5.53716532564563
rdh_sum =
    71.0642769909181
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 98
dh =
    5.50242732564563
rdh_sum =
    71.6082545248488
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 99
dh =
    5.46768882564563
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 100
dh =
    5.43295032564563
rdh_sum =
    72.6805498929594
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 101
dh =
    5.39821232564563
rdh_sum =
    73.2088598729541
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 102
dh =
    5.36347382564563
rdh_sum =
    73.7319403356225
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 103
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 104
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 105
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 106
dh =
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rdh_sum =
    75.7722888661376
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 107
dh =
    5.19364232564563
rdh_sum =
    76.269777245452
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 108
dh =
    5.16083382564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 109
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 110
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 111
dh =
    5.14989782564563
rdh_sum =
    78.2267644475327
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 112
dh =
    5.20457832564563
rdh_sum =
    78.7259013028002
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 113
dh =
    5.21512382564563
rdh_sum =
    79.2266277797345
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 117
dh =
    4.84505282564563
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 118
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 119
dh =
    4.89426532564563
rdh_sum =
    80.5728552592305
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 120
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 124
dh =
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rdh_sum =
    81.4422191469747
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 125
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 126
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 127
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 140
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 141
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 142
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 143
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 144
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 145
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 146
dh =
    2.86424582564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 147
dh =
    2.79862882564563
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 148
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 149
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 150
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 151
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 152
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rdh_sum =
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Berm Factor Calculation: Iteration 3, Profile Segment: 155
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 156
dh =
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rdh_sum =
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Berm Factor Calculation: Iteration 3, Profile Segment: 157
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rdh_sum =
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Berm Factor Calculation: Iteration 3, Profile Segment: 158
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Berm Factor Calculation: Iteration 3, Profile Segment: 159
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 160
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 161
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 162
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 163
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 164
dh =
    2.22630432564563
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 165
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 166
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 167
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 168
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 169
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 170
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 171
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 172
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 173
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 174
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 175
dh =
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rdh_sum =
    87.4188896699288
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 176
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 177
dh =
    2.27779532564563
rdh_sum =
    87.6479139355773
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 178
dh =
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rdh_sum =
    87.7589040813013
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 180
dh =
    2.11621432564563
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 181
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 182
dh =
    2.23760532564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 183
dh =
    2.20807782564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 184
dh =
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rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 185
dh =
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rdh_sum =
    88.3746366665363
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 186
dh =
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rdh_sum =
    88.4637677423643
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 187
dh =
    1.94561082564563
rdh_sum =
    88.5473430382585
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 188
dh =
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rdh_sum =
    88.6260573434958
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 189
dh =
    1.83406182564563
rdh_sum =
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ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 190
dh =
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rdh_sum =
    88.7709661148347
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 191
dh =
    1.72907482564563
rdh_sum =
    88.8373747358325
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 192
dh =
    1.67658182564563
rdh_sum =
    88.8998973388493
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 193
dh =
    1.64377332564563
rdh_sum =
    88.9600467304425
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 194
dh =
    1.63064982564563
rdh_sum =
    89.019258866351
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 195
dh =
    1.61752632564563
```



```
rdh_sum =
    89.0775406464618
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 196
dh =
    1.60440282564563
rdh_sum =
    89.1348989852253
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 197
dh =
    1.59127982564563
rdh_sum =
    89.1913408463334
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 198
dh =
    1.56917732564563
rdh_sum =
    89.2462548251461
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 199
dh =
    1.53809532564563
rdh_sum =
    89.2990536464447
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 200
dh =
    1.50701382564563
rdh_sum =
    89.3497766106238
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 201
dh =
    1.47593232564563
rdh_sum =
    89.3984631660061
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 202
dh =
    1.44485082564563
rdh_sum =
    89.4451529397191
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 203
dh =
    1.41376932564563
rdh_sum =
    89.4898857342161
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 204
dh =
    1.38268732564563
rdh_sum =
    89.5327014932646
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 205
dh =
    1.35160582564563
rdh_sum =
    89.5736403906322
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 206
dh =
    1.32052432564563
rdh_sum =
    89.6127427337218
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 207
dh =
    1.27938232564563
rdh_sum =
    89.6494763275684
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 230
dh =
    -2.22269667435437
rdh_sum =
    89.864581241822
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 231
dh =
    -2.16036067435437
rdh_sum =
    90.0686766619864
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 232
dh =
    -2.09802467435437
```

```
rdh_sum =
    90.2619791032649
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 233
dh =
    -2.03568867435437
rdh_sum =
    90.4447129781502
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 234
dh =
    -1.97335267435437
rdh_sum =
    90.6171104322198
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 235
dh =
    -1.91101667435437
rdh_sum =
    90.7794111742744
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 236
dh =
    -1.84868067435437
rdh_sum =
    90.9318623009406
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 237
dh =
    -1.78634467435437
rdh_sum =
    91.0747181158696
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 238
dh =
    -1.72400867435437
rdh_sum =
    91.2082399436611
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 239
dh =
    -1.66167267435437
rdh_sum =
    91.3326959386508
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 240
dh =
    -1.62359767435437
rdh_sum =
    91.4517492625477
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 241
dh =
    -1.60978367435437
rdh_sum =
    91.5688680756012
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 242
dh =
    -1.59596967435437
rdh_sum =
    91.6840661368142
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 243
dh =
    -1.58215567435437
rdh_sum =
    91.7973572742128
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 244
dh =
    -1.56834167435437
rdh_sum =
    91.9087553843491
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 245
dh =
    -1.55452767435437
rdh_sum =
    92.0182744318018
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 246
dh =
    -1.54071367435437
rdh_sum =
    92.1259284486748
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 247
dh =
    -1.52689967435437
```

```
rdh_sum =
    92.2317315340926
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 248
dh =
    -1.51308567435437
rdh_sum =
    92.3356978536937
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 249
dh =
    -1.49543417435437
rdh_sum =
    92.4373378777191
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 250
dh =
    -1.47010817435437
rdh_sum =
    92.535681042143
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 251
dh =
    -1.44094517435437
rdh_sum =
    92.6302879791299
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 252
dh =
    -1.41178217435437
rdh_sum =
    92.7212236149184
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 253
dh =
    -1.38261917435437
rdh_sum =
    92.8085534637293
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 254
dh =
    -1.35345617435437
rdh_sum =
    92.8923436172723
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 255
dh =
    -1.32429317435437
rdh_sum =
    92.9726607341619
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 256
dh =
    -1.29513017435437
rdh_sum =
    93.049572029241
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 257
dh =
    -1.26596717435437
rdh_sum =
    93.1231452628161
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 258
dh =
    -1.23680417435437
rdh_sum =
    93.1934487298054
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 259
dh =
    -1.20764117435437
rdh_sum =
    93.2605512488005
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 260
dh =
    -1.17847817435437
rdh_sum =
    93.324522151045
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 261
dh =
    -1.14931517435437
rdh_sum =
    93.3854312693304
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 262
dh =
    -1.12015217435437
```

```

rdh_sum =
    93.4433489268122
ans =
!----- End Berm Factor Calculation, Iter: 3 -----!
berm_width =
    219
rB =
    0.714169433447429
rdh_mean =
    0.426681958569919
gamma_berm =
    0.590553779166689
gamma_berm =
    0.6
slope =
    0.172495267045574
Irb =
    2.1426994687816
gamma_berm =
    0.6
gamma_perm =
    1
gamma_beta =
    1
gamma_rough =
    0.6
gamma =
    0.36
ans =
!!! - - Iribaren number: 1.29 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:5.8 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
    7.11376900728523
! Berm_width is greater than 1/4 wave length
! Runup will be weighted average with foreshore calculation assuming depth limited wave height on berm
fore_H0 =
    6.63775593
upper_slope =
    0.142949999999999
upper_slope =
    0.142950032352692
upper_slope =
    0.142950062677596
upper_slope =
    0.142950091159563
upper_slope =
    0.142950117961641
upper_slope =
    0.142950143228193
upper_slope =
    0.142950167087503
upper_slope =
    0.142950189653953
upper_slope =
    0.142950184651122
upper_slope =
    0.142950205606223
upper_slope =
    0.142950225511188
upper_slope =
    0.142950244443027
upper_slope =
    0.142950262471399
upper_slope =
    0.142950279659471
w2 =
    0.0298717885582036
w1 =
    0.970128211441796
R2_new =
    7.23254923815925
R2del =
    0.00692188173678421
Z2 =
    16.5009945638049
% final 2% runup elevation
Z2=R2_new+SWEL
Z2 =
    16.5009945638049
diary off
-1.000000e+00

```